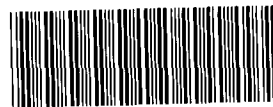


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## Technical Specifications

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Seep Collection and Storage Facility Operable Unit No 7

Final

January 1995

Rocky Flats Environmental Technology Site  
Golden Colorado

19 1995

ADMIN RECCRD

BZ A 000460

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# **Technical Specifications**

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## **Seep Collection and Storage Facility Operable Unit No. 7**

Final

January 1995

Rocky Flats Environmental Technology Site  
Golden, Colorado

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Approval, Rev 0  
January 1995  
RPD

**Technical Specifications**  
**Seep Collection and Storage Facility**  
**Operable Unit No. 7**

**APPROVED BY**

\_\_\_\_\_  
Group II Closures Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
QA Manager

\_\_\_\_\_  
Date

3

## Table of Contents

- 1 SECTION 02200 - EARTHWORK
- 2 SECTION 02232 - AGGREGATE BASE COURSE
- 3 SECTION 02935 - RIPRAP
- 4 SECTION 02970 - DRAIN ROCK
- 5 SECTION 03100 - CONCRETE FORMWORK
- 6 SECTION 03200 - CONCRETE REINFORCEMENT
- 7 SECTION 03300 - CAST-IN-PLACE CONCRETE
- 8 SECTION 05500 - METAL FABRICATIONS
- 9 SECTION 09900 - PAINTING
- 10 SECTION 13200 - SEEP STORAGE TANKS
- 11 SECTION 13210 - PUMPING EQUIPMENT
- 12 SECTION 13215 - PIPING
- 13 SECTION 13216 - PIPING INSULATION
- 14 SECTION 16050 - ELECTRICAL

## SECTION 02200 - EARTHWORK

### 1 Part 1 General

#### 1 1 Summary

- 1 1 1 Section includes clearing and grubbing, excavation, trenching, bedding, backfilling, compaction, and grading associated with the sitework and other work required for this project

#### 1 2 Related Sections

- 1 2 1 Section 01300 – Submittals (see Contract Document)
- 1 2 2 Section 01700 – Construction Safety Requirements (See Contract Document)
- 1 2 3 Section 02232 – Aggregate Base Course
- 1 2 4 Section 02935 – Riprap
- 1 2 5 Section 02970 – Drain Rock
- 1 2 6 Section 03300 – Cast-In-Place Concrete
- 1 2 7 Section 13215 – Piping

#### 1 3 References

The latest issues of the following publications form a part of this specification

- 1 3 1 ASTM C136, Sieve Analysis of Fine and Coarse Aggregates
- 1 3 2 ASTM D1556, Density of Soil in Place by the Sand-Cone Method
- 1 3 3 ASTM D1557, Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10-lb (4 54 kg) Rammer and 18-in (457 mm) Drop
- 1 3 4 ASTM D2487, Classification of Soils for Engineering Purposes
- 1 3 5 ASTM D2922, Density of Soil-Aggregate In-Place by Nuclear Method (Shallow Depth)

- 1 3 6 ASTM D3017, Determination of Moisture Content in Soils by Nuclear Method
- 1 3 7 ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- 1 3 8 ASTM E11, Specification for Wire-Cloth Sieves for Testing Purposes

#### 1 4 Submittals

- 1 4 1 Comply with "Section 01300 – Submittals " (See contract documents)
- 1 4 2 Initial test reports to be submitted by the subcontractor for approval of the material prior to use, or for imported materials, prior to shipment of the material to the site

##### 1 4 2 1 Sand for Pipe Bedding and Initial Utility Backfill

- Sieve Analysis

Pipe bedding and initial utility backfill in trenches shall be sand which passes a 20-mesh sieve and is retained on a 200-mesh sieve, when tested in accordance with ASTM C136 Sieve sizes shall conform to ASTM E11

- Submit initial test results indicating compliance to these requirements prior to shipment of the material to the site

- Moisture-Density Relationships

The Subcontractor shall submit laboratory test results for the moisture-density relationships for the sand (pipe bedding/initial utility backfill), capillary water barrier material, and import suitable fill material (if used) These will provide the Contractor with the maximum density and the optimum moisture content for the respective materials to be used in the work

##### 1 4 2 2 Suitable Fill Material

- Plasticity Index

At locations where backfill must be placed over piping or under structures or pavements, fill material shall be nonexpansive soils (Plasticity Index equal to or less than 12 percent when tested in accordance with ASTM D4318)

- Submit test results for Plasticity Index for this fill material to be used at these locations (at or under structures or paved areas), indicating compliance to these requirements
- Note that this suitable fill material may be imported or material excavated from the site trenching/excavations if it meets the specified requirements

- Moisture-Density Relationships same as 1 4 2 1

1 4 3 Proposed excavation, stockpiling, and regrading staging plan describing handling and transport of on-site and off-site materials

## **2 Part 2 Materials**

### **2 1 Excavated Material**

2 1 1 Earth and other materials that can be removed with commercially available excavating equipment Any rock that cannot be removed as described above or other unsuitable material or unacceptable soil encountered shall be removed and disposed at the existing adjacent landfill

### **2 2 Fill Material**

2 2 1 Fill material shall be imported or on-site soil borrow free from deleterious materials described below under "Unsuitable Materials " The maximum particle size shall be one-and one-half (1½) inches in any direction Acceptable soils are those meeting the requirements of ASTM D2487 for SP-SM, SM, SC, or ML The use of CL or OL materials will require the approval of the Engineer

2 2 2 Unsuitable Materials include all soil materials that contain waste, debris, roots, organic matter, frozen matter, stone or rock with any dimension greater than 6 inches, or other materials that are determined by the Contractor's representative to be unsuitable for stable, compacted backfill purposes Unsuitable material to be transferred to the landfill

### **2 3 Equipment**

2 3 1 All equipment and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times

- 2 3 2 The equipment shall be adequate and shall have the capability of producing the indicated compaction requirements and other quality requirements specified herein

### 3 Part 3 Execution

#### 3 1 Preparation

- 3 1 1 Verify all lines, limits, and grades shown on the drawings prior to beginning construction activities
- 3 1 2 Prior to starting any soil disturbance, excavations, backfilling, or other operations, an approved Integrated Work Control Program (IWCP) package shall be obtained from the Contractor. The IWCP package will include an approved soil disturbance plan that contains the information necessary to guide the safe execution of excavation/soil disturbances at the Rocky Flats Environmental Technology Site
- 3 1 3 Do not divert, remove, or pump any groundwater or water from any trench, manhole, or ditch without approval from the Contractor. All water dewatered from excavation and trenching activities to be pumped to the OU 7 pond upon approval
- 3 1 4 All streets, roads, grading, structures, utilities, and other improvements not specifically designated to be cleared, removed, stripped, or altered as a part of the work shall be protected from damage throughout the construction period. Any damage caused by the Construction Subcontractor, his employees, agents, or any lower-tiered subcontractors shall be immediately repaired to original condition at no additional cost to the Contractor
- 3 1 5 Traffic Control
- 3 1 5 1 Keep all roads, sidewalks, and parking areas that are not part of this project usable at all times
- 3 1 5 2 The Construction Subcontractor shall provide all necessary barricades, lights, signs, signals, etc., for the protection of the workers and the public, as established by the Occupational Safety and Health Administration (OSHA) Construction Safety and Health Regulation 29 CFR, Part 1926, Subpart G -



Signs, Signals and Barricades, and in Subpart P - Excavations, Trenching and Shoring

3 1 6 Existing Utilities

- 3 1 6 1 Known existing utilities will be indicated in the IWCP and on the drawings. The Construction Subcontractor shall hand excavate within 6 feet (or as directed by the Contractor) of areas where existing utilities are indicated.
- 3 1 6 2 Actual locations of all existing utilities within the excavation area shall be located by the Construction Subcontractor by hand excavation.
- 3 1 6 3 After the actual locations and routing of the existing utilities have been found to be accurately determinable through this hand excavation, and after approval from the Contractor's construction representative, the Construction Subcontractor may begin excavation using machinery in a manner acceptable to the Contractor.
- 3 1 6 4 After excavation by machinery has begun with the approval of the Contractor, the Construction Subcontractor continues to be fully responsible for all utilities that were found through hand excavation and/or that were indicated on the drawings and IWCP excavation permit.
- 3 1 6 5 Any existing utility in the IWCP and on the drawing that is damaged by the Construction Subcontractor shall be immediately repaired in a manner acceptable to the Contractor and at no additional cost to the Contractor.
- 3 1 6 6 If excavation will be within 10 feet of any existing electrical utility, lockout/tagout is required. The Construction Subcontractor shall provide 48-hour prior notice to the Contractor so that the Contractor can arrange for and perform this lockout/tagout.
- 3 1 6 7 Notify the Contractor immediately if any existing utilities that were not indicated are encountered during excavation.

- 3 1 6 8 Obtain approval from the Contractor before backfilling existing utilities Utility warning tape (provided by the Contractor) shall be placed 12 inches above existing utilities, including the new forcemain
- 3 1 7 All excavations, trenching, and shoring shall comply with the rules and regulations as established by OSHA Construction Safety and Health Regulations 29 CFR, Part 1926, Subpart P, Excavation, Trenching and Shoring and shall comply with the EG&G Rocky Flats Health and Safety Practices (HSP) Manual, Section HSP-12 08 OSHA Pamphlet 2226, Excavation and Trenching Operations, can be used as an additional aid Subcontractor shall comply with OSHA 29 CFR 1910 146, confined space entrys, EG&G, H&S Manual Section 6 04
- 3 1 8 In excavations and trenches, proper allowances shall be made for pipe installation, formwork, concrete work, shoring, inspection, and any other work required in the excavation Bottoms of excavations and trenches shall be level, clean, and clear of loose materials, trash, and debris
- 3 1 9 Protect bottoms of all excavations from free-standing water and frost All soils in excavations or where fills will be placed shall be protected from movement or other damage due to frost penetration Soil backfill, insulation, heat, or other acceptable methods shall be used to protect soils during periods of the year in which frost penetration is possible
- 3 1 10 Trenching for Underground Utilities
- 3 1 10 1 General
- 3 1 10 1 1 All trench excavations shall be made by open cut to the lines and grades as shown on the drawings, within the tolerances specified, through whatever material is encountered
- 3 1 10 1 2 Trench excavations shall not advance more than 50 feet ahead of pipe laying and backfilling operations
- 3 1 10 1 3 All suitable material generated from excavation and trenching operations shall be used for backfilling as specified herein Material

|                                   |                |                  |
|-----------------------------------|----------------|------------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044   |
| OU 7 Seep Collection and Storage  | Section        | Earthwork, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995     |
| Category                          | Organization   | RPD              |

that is deemed unsuitable for backfill shall be disposed of by the Construction Subcontractor at his expense in the adjacent landfill

3 1 10 1 4 At the conclusion of each days work, all trenches shall be either backfilled, barricaded, or adequately fenced and protected such that injuries to pedestrians, motorists, and wildlife would not be possible

3 1 10 1 5 Install contractor-furnished utility warning tape 12 inches above new double contained forcemain and any existing underground utilities exposed during the work

#### 3 1 10 2 Trench Width

3 1 10 2 1 Trenches shall be excavated to the width necessary to permit the pipe to be laid and jointed properly and the backfill placed as specified

#### 3 1 10 3 Trench Depth

3 1 10 3 1 When the excavation is in firm earth, care shall be taken to avoid excavation below the established grade

#### 3 1 10 4 Trench Bottom

3 1 10 4 1 Protect and maintain when suitable natural materials are encountered Remove rock fragments and materials disturbed during excavation or raveled from trench walls

3 1 10 4 2 Unstable Trench Conditions When soft or otherwise unstable foundation material is encountered in the bottom of the trench, it shall be removed and replaced with fill material described in this specification A trench bottom that is wet will not be considered evidence that the trench bottom is unstable

### 3 2     *Drainage*

- 3 2 1     Excavation and site grading shall be performed in such a manner that the area of the site and the area immediately surrounding the site will be continually and effectively drained by gravity or by temporary pumps
- 3 2 2     Water shall not be permitted to accumulate in the excavation or adjacent to structure foundations
- 3 2 3     The excavation shall be drained by methods that will prevent wetting of the foundation bottom, undercutting of footings, or other conditions detrimental to proper construction procedures
- 3 2 4     The excavation shall be kept dry during digging, subgrade preparation, and continually thereafter until the structure to be built or installed is completed to the extent that all footings and foundation walls have been placed and foundation trenches are backfilled and no damage from hydrostatic pressure, floatation, or other causes will result

### 3 3     *Clearing and Grubbing*

#### 3 3 1     Clearing

- 3 3 1 1     Clearing shall consist of satisfactory disposal of vegetation designated for removal, including snags, brush, and rubbish occurring in the areas to be cleared and grubbed for the work
- 3 3 1 2     Roots, brush, and other vegetation in areas to be cleared for the work shall be cut off flush with or below the original ground surface

#### 3 3 2     Grubbing

- 3 3 2 1     Grubbing shall consist of the removal and disposal of brush and matted roots from the areas required to be cleared and grubbed for the work
- 3 3 2 2     Material not suitable for foundation purposes shall be removed to a depth of not less than 18 inches below the original ground surface level of the ground in

12

areas designated as construction areas under the project, such as areas for buildings and areas to be paved

3 3 2 3 Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the required surface elevation for the work

3 3 3 Roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be disposed of by the Construction Subcontractor in accordance with paragraph entitled "Disposal of Debris and Excess Material "

#### 3 4 *Overexcavation*

3 4 1 All unstable materials encountered below the established elevation of the excavation that will not provide a firm foundation for subsequent work shall be removed and replaced in the landfill

3 4 2 Excavations carried below the depths indicated or required, unless directed by the Contractor, shall be returned to the proper elevation in accordance with the procedure specified herein for backfilling at no additional cost to the Contractor

#### 3 5 *Backfilling*

3 5 1 All suitable material removed from excavations shall be used in the backfilling of the excavations prior to bringing in import suitable fill material No excavated material shall be wasted without approval of the Contractor

3 5 2 Prior to backfilling, clean excavations of all trash and debris, and compact the trench or excavation subgrade to the requirements indicated below in paragraph entitled "Compaction "

3 5 2 1 The existing grade or subgrade to receive fill shall be scarified to a minimum depth of 6 inches before the fill is started, such that the subgrade will be compacted (and moistened or dried, if necessary) to meet the density/moisture requirements indicated below

- 3 5 3 Backfilling shall not begin until construction below finish grade has been approved, unless otherwise noted herein
- 3 5 4 Fill shall be placed in horizontal layer not in excess of 10-inch compacted thickness and shall have a moisture content as specified herein such that the required degree of compaction may be obtained Each layer shall be compacted by hand or machine tampers or by other suitable equipment Compaction and testing requirements shall be in accordance with the requirements indicated below
- 3 5 5 If the Construction Subcontractor cannot attain the compaction densities required below using 10-inch-thick compacted lifts, then the Construction Subcontractor shall reduce the required compaction lift thickness to 6 inches This reduction in lift thickness shall be done at no additional cost to the Contractor
- 3 5 6 Placing Fill Material
- 3 5 6 1 Completed fill shall correspond to the existing grades/elevations (see paragraph entitled "Grading")
- 3 5 6 2 Place fill materials in successive layers of loose materials not more than 13 inches deep to achieve the specified 10-inch maximum compacted lift thickness Note that if the compacted lift thickness must be reduced as described above, the loose layer thickness shall not exceed 8 inches
- 3 5 6 3 Uniformly spread each layer using approved devices and machinery
- 3 5 6 4 Fill materials shall be moistened (or dried) and thoroughly mixed as necessary to attain the moisture content indicated in paragraph entitled "Compaction "
- 3 5 6 5 Compact each layer of fill thoroughly using the appropriate compaction equipment Compact each layer to the requirements indicated below
- 3 5 6 6 Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of the footing, the area remaining shall be compacted by

power-driven hand/walk-behind tampers, compactors, or roller suitable for the material being compacted

3 5 6 7 Backfill shall be placed carefully around pipes to avoid damage to coatings

3 5 6 8 Backfill shall not be placed against newly poured concrete slabs

3 5 6 8 1 The Construction Subcontractor shall inform the Contractor if additional concrete cylinder samples are to be used for the purpose of determining if the concrete has attained the design strength prior to the cylinder test age indicated in "Section 03300 - Concrete "

3 5 6 9 Backfill shall be brought up evenly on each side of the slabs and sloped to drain away from the slabs

### 3 6 Subgrade Preparation for Concrete

3 6 1 Backfill the excavations and trenches within areas to receive concrete shall be performed as indicated above in paragraph entitled "Backfilling," to the elevation required for the placement of the aggregate base course or concrete, and as indicated on the drawings

3 6 2 Backfill shall be compacted to the requirements indicated in paragraph entitled "Compaction "

3 6 3 Smoothness

3 6 3 1 The completed subgrade for the areas to receive concrete shall show no deviations in excess of 1 inch when tested with a 10-foot straightedge

3 6 4 Grade Tolerance

3 6 4 1 The finished surface of the completed subgrade for areas to receive concrete shall be within 0 05 foot (plus/minus) of the grade/elevation required or indicated for the bottom of capillary water barrier or concrete

3 6 5 See "Section 03300 - Concrete" for requirements for installation and placement of the concrete

3 7     *Compaction*

3 7 1     All soil materials, including sand bedding and suitable fill material, shall be compacted and tested to the requirements indicated herein

3 7 2     Hydraulic compactors attached to the backhoe boom shall not be used to compact the initial utility backfill, since this could damage the pipe. Vibratory plate compactors or other suitable compaction equipment shall be used for the initial utility backfill

3 7 3     Except as otherwise specified, moisture/density relationships shall be as determined by American Society for Testing and Materials (ASTM D1557) and the degree of field compaction shall be controlled with ASTM D1556 or ASTM D2922 and moisture content shall be controlled using ASTM D3017. All tests will be performed by the Subcontractor or the Subcontractor's designated representative

3 7 3 1     Compaction of 90% of maximum density will be required for pipe bedding and utility backfill

3 7 3 2     Compaction of 95% of maximum density will be required under concrete slabs, except as noted above for the pipe bedding and utility backfill

3 7 3 3     A minimum of one field compaction density/moisture test shall be required for each 1,000 square feet, or portion thereof, for each lift

3 7 4     Moisture Content

3 7 4 1     Backfill in overlot site grading areas (not at or under structure or pavements) will not require moisture content readings. The moisture content of the soil in these locations shall be that necessary to attain the compaction density requirements

3 7 4 2     In areas where backfill is placed, the material, except as noted below, shall be moistened (or dried, if too wet) and thoroughly mixed to attain a moisture content between 2% below and 4% above optimum moisture when compacted

3 7 4 2 1     The sand used for pipe bedding and initial utility backfill shall be exempt from these moisture content range requirements, but should



have a moisture content necessary to attain the indicated  
compaction density requirements

3 7 5 The Construction Subcontractor shall submit laboratory test results for the moisture/density relationships for the sand (pipe bedding/initial utility backfill), and import suitable fill material (if used) These will provide the maximum density and the optimum moisture content for the respective materials to be used in the work

3 7 6 The Contractor will pay for any test for soil compaction or moisture content that meets the requirements for the specifications The Construction Subcontractor shall pay for any soil tests that indicate the soil compaction and/or moisture content does not meet requirements of the specifications

3 8 *Reconditioning of Subgrades*

3 8 1 Approved compacted subgrades that are disturbed by the Construction Subcontractor's subsequent operations or adverse weather shall be scarified and compacted as specified herein to the required density and moisture limits prior to further construction thereon

3 8 2 Any rework due to the above actions shall be performed at no additional cost to the Contractor

3 9 *Disposal of Debris and Excess Material*

3 9 1 Rubble, debris, and material from trenching operations that is not suitable for fill shall be disposed of in the existing adjacent landfill

3 9 2 Excess material from excavation, unsuitable for or not required for backfilling, shall be wasted, spread, and leveled or graded as directed by the Contractor

## SECTION 02232 - AGGREGATE BASE COURSE

### 1 Part 1 General

#### 1.1 Description

The work of this section consists of furnishing and placing one or more courses of aggregate and filler, if required, on a prepared subgrade

#### 1.2 Submittals

In accordance with Section 01300 (see contract drawings) If materials are obtained from a commercial source, submit certification from the supplier certifying that aggregate base course meets the requirements of this section

#### 1.3 Quality Assurance

Testing required to determine compliance with the requirements for the work of this section will be the responsibility of the Subcontractor

### 2 Part 2 Materials

#### 2.1 Aggregate

Clean, hard, durable fragments or particles of crushed stone, crushed slag, or crushed or natural gravel Materials that break up due to freeze-thaw or wet-dry cycling shall not be used

Shall be Type 1, Grading B as per ASTM D1241-68, as follows

| <u>Sieve Size</u> | <u>% Passing</u> |
|-------------------|------------------|
| 2 in              | 100              |
| 1 in              | 75 - 95          |
| 3/8 in            | 40 - 75          |
| No 4              | 30 - 60          |
| No 10             | 20 - 45          |
| No 40             | 15 - 30          |
| No 200            | 5 - 15           |

### 3 Part 3 Execution

#### 3.1 Placing

The minimum compacted thickness of aggregate base surfacing shall be 3 inches. If the required compacted depth of the aggregate base course exceeds 4 inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 4 inches.

#### 3.2 Mixing

A Mix the aggregate by any one of the three following methods:

- 1 Stationary Plant Method Mix aggregate base course and appropriate amount of water for compaction in an approved mixer. After mixing, transport aggregate to the job site while it contains the proper moisture content and place on the roadbed by means of an approved aggregate spreader. Before compaction, remove excess moisture.
- 2 Travel Plant Method After the material for each layer has been placed through an aggregate spreader or window sizing device, it shall be uniformly mixed by a traveling mixing plant.
- 3 Road Mix Method After placing each layer, mix the materials while at optimum moisture content by means of motor graders or other approved equipment until the moisture is uniform throughout.

#### 3.3 Compaction

Continue compaction of each layer until a density of not less than 95 percent of the maximum density, as determined by AASHTO T180, Method D, has been achieved. In-place field density determinations will be made in accordance with AASHTO T191, T205, or other recognized method. Random tests for compacted depth will be made during the progress of the work.

3 4 *Surface Finishing*

A Use a smooth steel wheel roller for the final rolling of top surface base course. Water surface and evenly spread loose stones before final rolling. Make minimum of two complete passes over area to embed stones. Correct soft spots during rolling.

B Compacted base course surface shall be smooth and free from waves and other irregularities. Unsatisfactory portions of base course shall be torn up, reworked, relaid, and rerolled, at no additional expense to the owner.

3 5 *Material Acceptance Requirements*

Acceptance will be based on periodic samples and tests taken following mixing and before laying.

3 6 *Maintenance*

Maintain base course in a satisfactory condition until surfaced or until final acceptance.

## SECTION 02935 - RIPRAP

### 1 Part 1 General

#### 1.1 Description

The work of this section consists of furnishing and placing stone riprap for the surface water diversion berm around the seep collection system

### 2 Part 2 Materials

#### 2.1 Hand Laid Riprap

Shall be well-graded angular quarry stones, sound and hard, of durability to withstand exposure to water and weathering

#### 2.2 Riprap Size

The design stone size is the  $d_{50}$  median stone diameter, which is defined as the stone size that 50% of the mixture by weight is larger than. Diameter of the largest stone shall be 1.5 times the design stone,  $d_{50}$ .

#### 2.3 Riprap Thickness

Riprap layer shall be a minimum of 1.5 times the  $d_{50}$  stone size

### 3 Part 3 Execution

#### 3.1 Riprap Placement

Rocks shall be laid by hand. Placing of rocks by dumping will not be permitted.

Local surface irregularities of the slope protection shall not vary from the planned slope by more than one foot measured at right angles to the slope.

21

## SECTION 02970 - DRAIN ROCK

### 1 Part 1 General

#### 1.1 Description

The work under this section consists of furnishing and installing drain rock for the seep collection system

#### 1.2 Submittals

In accordance with Section 01300 (See Contract Documents)

### 2 Part 2 Material

#### 2.1 Drain Rock

A Source The source of drain rock shall be from an approved off-site borrow area

B Size and Permeability The drainage rock shall be subangular to rounded washed gravel meeting the following gradation requirements

| <u>Sieve Size</u> | <u>% Passing</u> |
|-------------------|------------------|
| 1 in              | 100              |
| 3/4 in            | 80 - 100         |
| 3/8 in            | 10 - 30          |
| No 4              | 0 - 4            |
| No 40             | 0 - 1            |

C Testing Test frequency of drain rock shall conform to the following

Particle Size ASTM D 422 1 test for the drain rock used  
at the seep collection facility

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Drain Rock, Rev 0  
January 1995  
RPD

### 3 Part 3 Execution

#### 3.1 Drain Rock Placement

- A The drainage rock shall be placed as shown on the drawings
- B Dumping of material onto drainage pipe installations will not be permitted Spreading of material shall be done with care to minimize folds in the liner and to ensure that damage to drain pipe will not occur
- C Drainage rock materials may be placed in one continuous lift unless directed otherwise by the engineer No compaction is required for the drain rock layer

## SECTION 03100 - CONCRETE FORMWORK

### 1 Part 1 General

#### 1 1 Section Includes

- 1 1 1 Formwork for cast-in-place concrete, with shoring, bracing, and anchorage
- 1 1 2 Openings for other work
- 1 1 3 Form accessories
- 1 1 4 Form stripping

#### 1 2 References

- 1 2 1 ACI 347 - Recommended Practice for Concrete Formwork
- 1 2 2 PS-1 - Construction and Industrial Plywood

#### 1 3 Design Requirements

- 1 3 1 Design, engineer, and construct formwork, shoring, and bracing to conform to ACI code requirements, resultant concrete to conform to required shape, line, and dimension

#### 1 4 Quality Assurance

- 1 4 1 Perform work in accordance with ACI 347

#### 1 5 Regulatory Requirements

- 1 5 1 Conform to applicable code for design, fabrication, erection, and removal of formwork

#### 1 6 Coordination

- 1 6 1 Coordinate this section with other sections of work that require attachment of components to formwork



- 1 6 2 If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding

## **2 Part 2 Products**

### **2 1 Wood Form Materials**

- 2 1 1 Form Materials At the discretion of the Contractor

### **2 2 Prefabricated Forms**

- 2 2 1 Preformed Steel Forms Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces

- 2 2 2 Glass Fiber Fabric Reinforced Plastic Forms Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces

### **2 3 Formwork Accessories**

- 2 3 1 Form Release Agent Colorless mineral oil that will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete

- 2 3 2 Corners Chamfered, wood strip type,  $\frac{3}{4}$  by  $\frac{3}{4}$  inch size, maximum possible lengths

- 2 3 3 Nails, Spikes, Lag Bolts, Through Bolts, Anchorages Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete

## **3 Part 3 Execution**

### **3 1 Examination**

- 3 1 1 Verify lines, levels, and centers before proceeding with formwork Ensure that dimensions agree with drawings

3 2 *Earth Forms*

3 2 1 Earth forms are not permitted

3 3 *Erection - Formwork*

3 3 1 Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301

3 3 2 Provide bracing to ensure stability of formwork Shore or strengthen formwork subject to overstressing by construction loads

3 3 3 Arrange and assemble formwork to permit dismantling and stripping Do not damage concrete during stripping Permit removal of remaining principal shores

3 3 4 Align joints and make watertight Keep form joints to a minimum

3 3 5 Obtain approval before framing openings in structural members that are not indicated on drawings

3 3 6 Provide chamfer strips on external corners of foundation walls

3 4 *Application - Form Release Agent*

3 4 1 Apply form release agent on formwork in accordance with manufacturer's recommendations

3 4 2 Apply prior to placement of reinforcing steel, anchoring devices, and embedded items

3 4 3 Do not apply form release agent where concrete surfaces will receive special finishes that are affected by agent Soak inside surfaces of untreated forms with clean water Keep surfaces coated prior to placement of concrete

3 5 *Inserts, Embedded Parts, and Openings*

3 5 1 Provide formed openings where required for items to be embedded in or passing through concrete work

3 5 2 Locate and set in place items that will be cast directly into concrete

3 5 3 Coordinate work of other sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts

3 5 4 Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement

3 5 5 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain

3 5 6 Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces

### 3 6 *Form Cleaning*

3 6 1 Clean and remove foreign matter within forms as erection proceeds

3 6 2 Clean formed cavities of debris prior to placing concrete

3 6 3 Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports

3 6 4 During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete construction proceed within heat enclosure. Use compressed air or other means to remove foreign matter

### 3 7 *Formwork Tolerances*

3 7 1 Construct formwork to maintain tolerances required by ACI 301

### 3 8 *Field Quality Control*

3 8 1 Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure

3 8 2 Do not reuse wood formwork more than four times for concrete surfaces to be exposed to view. Do not patch formwork

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Concrete Formwork, Rev 0  
January 1995  
RPD

3 9     *Form Removal*

- 3 9 1     Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads
- 3 9 2     Loosen forms carefully    Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view
- 3 9 3     Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged    Discard damaged forms

28

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Concrete Reinforcement, Rev 0  
January 1995  
RPD

## SECTION 03200 - CONCRETE REINFORCEMENT

### 1 Part 1 General

#### 1 1 Section Includes

1 1 1 Reinforcing steel bars, wire fabric, and accessories for cast-in-place concrete

#### 1 2 References

1 2 1 ACI 301 - Structural Concrete for Buildings

1 2 2 ACI 318 - Building Code Requirements For Reinforced Concrete

1 2 3 ACI SP-66 - American Concrete Institute - Detailing Manual

1 2 4 ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement

1 2 5 ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement

1 2 6 ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement

1 2 7 CRSI - Concrete Reinforcing Steel Institute Manual of Practice

1 2 8 CRSI 63 - Recommended Practice for Placing Reinforcing Bars

1 2 9 CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature

#### 1 3 Submittals

1 3 1 Submit under provisions of Section 01300 (See Contract Documents)

1 3 2 Shop Drawings Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices

1 3 3 Manufacturer's Certificate Certify that products meet or exceed specified requirements

|                                   |                |                               |
|-----------------------------------|----------------|-------------------------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                |
| OU 7 Seep Collection and Storage  | Section        | Concrete Reinforcement, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995                  |
| Category                          | Organization   | RPD                           |

#### 1 4 *Quality Assurance*

- 1 4 1 Perform work in accordance with CRSI 63, 65, and Manual of Practice ACI 301 ACI SP-66 ACI 318

#### 1 5 *Coordination*

- 1 5 1 Coordinate with placement of formwork, formed openings, and other work

### 2 **Part 2 Products**

#### 2 1 *Reinforcement*

- 2 1 1 Reinforcing Steel ASTM A615, 60 ksi yield grade, deformed billet steel bars, plain finish
- 2 1 2 Stirrup Steel ANSI/ASTM A82, plain finish
- 2 1 3 Welded Steel Wire Fabric ASTM A185 plain type, in flat sheets, plain finish

#### 2 2 *Accessory Materials*

- 2 2 1 Tie Wire Minimum 16 gage annealed type
- 2 2 2 Chairs, Bolsters, Bar Supports, Spacers Sized and shaped for strength and support of reinforcement during concrete placement conditions
- 2 2 3 Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces Plastic coated steel type, size and shape as required

#### 2 3 *Fabrication*

- 2 3 1 Fabricate concrete reinforcing in accordance with CRSI Manual of Practice ACI SP-66 ACI 318
- 2 3 2 Locate reinforcing splices not indicated on drawings, at point of minimum stress

30

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Concrete Reinforcement, Rev 0  
January 1995  
RPD

### **3 Part 3 Execution**

#### **3 1 Placement**

3 1 1 Place, support, and secure reinforcement against displacement Do not deviate from required position

3 1 2 Accommodate placement of formed openings

3 1 3 Conform to ACI 318 code for concrete cover over reinforcement

#### **3 2 Field Quality Control**

3 2 1 Field inspection will be performed under provisions of the Statement of Work

31

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### 1 Part 1 General

#### 1 1 Section Includes

1 1 1 Floors and slabs on grade

1 1 2 Control and expansion and contraction joint devices associated with concrete work,  
including joint sealants

1 1 3 Equipment pads

#### 1 2 References

1 2 1 ACI 301 - Structural Concrete for Buildings

1 2 2 ACI 302 - Guide for Concrete Floor and Slab Construction

1 2 3 ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing  
Concrete

1 2 4 ACI 305R - Hot Weather Concreting

1 2 5 ACI 306R - Cold Weather Concreting

1 2 6 ACI 308 - Standard Practice for Curing Concrete

1 2 7 ACI 318 - Building Code Requirements for Reinforced Concrete

1 2 8 ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type)

1 2 9 ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type

1 2 10 ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and  
Structural Construction (Nonextruding and Resilient Bituminous Types)



|                                   |                |                               |
|-----------------------------------|----------------|-------------------------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                |
| OU 7 Seep Collection and Storage  | Section        | Cast-In-Place Concrete, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995                  |
| Category                          | Organization   | RPD                           |

1 2 11 ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for  
Concrete Paving and Structural Construction

1 2 12 ASTM C33 - Concrete Aggregates

1 2 13 ASTM C94 - Ready-Mixed Concrete

1 2 14 ASTM C150 - Portland Cement

1 2 15 ASTM C260 - Air Entraining Admixtures for Concrete

1 2 16 ASTM C494 - Chemicals Admixtures for Concrete

### 1 3 *Submittals*

1 3 1 Submit under provisions of Section 01300 (See Contract Documents)

1 3 2 Product Data Provide data on joint devices, attachment accessories, admixtures

1 3 3 Samples Submit two-inch-long samples of expansion/contraction joint and control joint

1 3 4 Manufacturer's Installation Instructions Indicate installation procedures and interface  
required with adjacent work

### 1 4 *Project Record Documents*

1 4 1 Submit under provisions of Section 01300

1 4 2 Accurately record actual locations of embedded utilities and components that are  
concealed from view

### 1 5 *Quality Assurance*

1 5 1 Perform work in accordance with ACI 301

1 5 2 Conform to ACI 305R when concreting during hot weather

1 5 3 Conform to ACI 306R when concreting during cold weather

1 6 *Coordination*

- 1 6 1 Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories

2 **Part 2 Products**

2 1 *Concrete Materials*

- 2 1 1 Cement Rocky Flats, Type II modified or Type V

- 2 1 2 Fine and Coarse Aggregates ASTM C33

- 2 1 3 Water Clean and not detrimental to concrete

2 2 *Admixtures*

- 2 2 1 Air Entrainment ASTM C260

- 2 2 2 Chemical ASTM C494, Type A - Water Reducing, Type B - Retarding, Type C - Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating

2 3 *Accessories*

- 2 3 1 Non-Shrink Grout Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days

2 4 *Joint Devices and Filler Materials*

- 2 4 1 Joint Filler ASTM D1751, ASTM D994, Asphalt impregnated fiberboard or felt, ¼ inch thick, tongue and groove profile

- 2 4 2 Construction Joint Devices Integral galvanized steel 1½ inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches ribbed steel spikes with tongue to fit top screed edge

2 4 3 Sealant and Primer Polyurethane type

2 5 *Concrete Mix*

2 5 1 Mix concrete in accordance with ACI 304 Deliver concrete in accordance with ASTM C94

2 5 2 Select proportions for normal weight concrete in accordance with ACI 301 Method 1

2 5 3 Provide concrete to the following criteria

2 5 3 1 Compressive Strength (28 days) 3,000 psi for slab on grade

2 5 3 2 Slump 1 to 3 inches

2 5 3 3 Maximum Water/Cement Ratio 0.5

2 5 3 4 Entrained Air 5%  $\pm$  1%

2 5 4 Use accelerating admixtures in cold weather only when approved by Architect/Engineer  
Use of admixtures will not relax cold weather placement requirements

2 5 5 Use calcium chloride only when approved by Contractor

2 5 6 Use set retarding admixtures during hot weather only when approved by Contractor

2 5 7 Add air entraining agent to normal weight concrete mix for work exposed to exterior

3 **Part 3 Execution**

3 1 *Examination*

3 1 1 Verify requirements for concrete cover over reinforcement

3 1 2 Verify that anchors, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete

3 2 *Preparation*

- 3 2 1 Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions
- 3 2 2 In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout

3 3 *Placing Concrete*

- 3 3 1 Place concrete in accordance with ACI 304, ACI 301, and ACI 318
- 3 3 2 Place concrete in forms within 90 minutes of beginning mixing
- 3 3 3 Notify Contractor minimum 24 hours prior to commencement of operations
- 3 3 4 Ensure reinforcement, inserts, embedded parts, formed joint fillers, and joint devices are not disturbed during concrete placement
- 3 3 5 Install joint fillers, in accordance with manufacturer's instructions
- 3 3 6 Separate slabs on grade from vertical surfaces with ½ inch thick joint filler
- 3 3 7 Extend joint filler from bottom of slab to within ½ inch of finished slab surface
- 3 3 8 Install joint devices in accordance with manufacturer's instructions
- 3 3 9 Install construction joint device in coordination with floor slab pattern placement sequence Set top to required elevations Secure to resist movement by wet concrete
- 3 3 10 Install joint device anchors Maintain correct position to allow joint cover flush with floor and wall finish
- 3 3 11 Install joint covers in longest practical length, when adjacent construction activity is complete
- 3 3 12 Maintain records of concrete placement Record date, location, quantity, air temperature, and test samples taken

36

|                                   |                |                               |
|-----------------------------------|----------------|-------------------------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                |
| OU 7 Seep Collection and Storage  | Section        | Cast-In-Place Concrete, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995                  |
| Category                          | Organization   | RPD                           |

3 3 13 Place concrete continuously between predetermined expansion, control, and construction joints

3 3 14 Do not interrupt successive placement, do not permit cold joints to occur

3 3 15 Place floor slabs in checkerboard pattern indicated

3 3 16 Saw cut joints within 24 hours after placing Using 3/16-inch-thick blade, cut into ¼ depth of slab thickness

3 3 17 Screed slabs on grade level, maintaining surface flatness of maximum ¼ inch in 10 feet

#### 3 4 *Concrete Finishing*

3 4 1 Provide formed concrete surfaces to be left exposed with smooth rubbed finish

3 4 2 Steel trowel all floor surfaces

3 4 3 In areas with floor drains, maintain floor elevation at walls, pitch surfaces uniformly to drains as indicated on drawings

#### 3 5 *Curing and Protection*

3 5 1 Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury

3 5 2 Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete

3 5 3 Ponding Maintain 100 percent coverage of water over floor slab areas continuously for 4 days

3 5 4 Spraying Spray water over floor slab areas and maintain wet for 7 days

#### 3 6 *Field Quality Control*

3 6 1 Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400

- 3 6 2 Provide free access to work and cooperate with appointed firm
- 3 6 3 Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of work
- 3 6 4 Tests of cement and aggregates may be performed to ensure conformance with specified requirements
- 3 6 5 Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed
- 3 6 6 One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions a concrete it represents
- 3 6 7 One slump test will be taken for each set of test cylinders taken In addition, slump tests shall be taken if the consistency of the concrete appears to vary

3 7 *Patching*

- 3 7 1 Allow Contractor to inspect concrete surfaces immediately upon removal of forms
- 3 7 2 Excessive honeycomb or embedded debris in concrete is not acceptable Notify Contractor upon discovery
- 3 7 3 Patch imperfections in accordance with ACI 301

3 8 *Defective Concrete*

- 3 8 1 Defective Concrete Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements
- 3 8 2 Repair or replacement of defective concrete will be determined by the Contractor
- 3 8 3 Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area

## SECTION 05500 - METAL FABRICATIONS

### 1 Part 1 General

#### 1 1 Section Includes

- 1 1 1 Fabricated ferrous metal items

#### 1 2 References

- 1 2 1 ASTM A36 - Structural Steel
- 1 2 2 ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe
- 1 2 3 ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip
- 1 2 4 ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- 1 2 5 ASTM A283 - Carbon Steel Plates, Shapes, and Bars
- 1 2 6 ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners
- 1 2 7 ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products
- 1 2 8 AWS A2 0 - Standard Welding Symbols
- 1 2 9 AWS D1 1 - Structural Welding Code
- 1 2 10 SSPC - Steel Structures Painting Council
- 1 2 11 ASTM A-603 Wire Rope

#### 1 3 Submittals

- 1 3 1 Submit under provisions of Section 01300 (See Contract Document)
- 1 3 2 Submit welder qualifications

1 3 3 Shop Drawings Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories Include erection drawings, elevations, and details

1 3 4 Indicate welded connections using standard AWS A2 0 welding symbols Indicate net weld lengths

1 3 5 Submit qualified weld procedures

1 3 6 Submit qualified weld tests and inspection reports

#### 1 4 *Field Measurements*

1 4 1 Verify that field measurements are as indicated on shop drawings

#### 1 5 *Quality Assurance*

1 5 1 Provide welder qualifications and perform welding, tests, and inspections in accordance with AWS structural welding code, AWS D1 1, Latest Edition

### 2 **Part 2** **Products**

#### 2 1 *Materials*

2 1 1 Steel Sections ASTM A36

2 1 2 Pipe ASTM A53, Grade B Schedule 40

2 1 3 Bolts, Nuts, and Washers ASTM A307

2 1 4 Welding Materials AWS D1 1, type required for materials being welded

2 1 5 Shop and Touch-Up Primer SSPC 15, Type 1, red oxide

2 1 6 Steel Wire Rope, Galvanized

#### 2 2 *Fabrication*

2 2 1 Fit and shop assemble in largest practical sections, for delivery to site



- 2 2 2 Fabricate items with joints tightly fitted and secured
- 2 2 3 Continuously seal joined members by continuous welds
- 2 2 4 Grind exposed joints flush and smooth with adjacent finish surface Make exposed joints butt tight, flush, and hairline Ease exposed edges to small uniform radius
- 2 2 5 Exposed Mechanical Fastenings Flush countersunk screws or bolts, unobtrusively located, consistent with design of component, except where specifically noted otherwise
- 2 2 6 Supply components required for anchorage of fabrications Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise

### 2 3 *Finishes*

- 2 3 1 Prepare surfaces to be primed in accordance with SSPC SP2
- 2 3 2 Do not prime surfaces in direct contact with concrete or where field welding is required
- 2 3 3 Prime paint items with one coat

## 3 **Part 3 Execution**

### 3 1 *Examination*

- 3 1 1 Verify that field conditions are acceptable and are ready to receive work
- 3 1 2 Beginning of installation means erector accepts existing conditions

### 3 2 *Preparation*

- 3 2 1 Clean and strip primed steel items to bare metal where site welding is required
- 3 2 2 Supply items required to be cast into concrete with setting templates, to appropriate sections

3 3 *Installation*

- 3 3 1 Install items plumb and level, accurately fitted, free from distortion or defects
- 3 3 2 Allow for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments
- 3 3 3 Field weld components indicated on drawings
- 3 3 4 Perform field welding in accordance with AWS D1 1
- 3 3 5 Obtain Contractor's approval prior to site cutting or making adjustments not scheduled
- 3 3 6 After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete

3 4 *Erection Tolerances*

- 3 4 1 Maximum Variation From Plumb  $\frac{1}{4}$  inch non-cumulative
- 3 4 2 Maximum Offset From True Alignment  $\frac{1}{4}$  inch

## SECTION 09900 - PAINTING

### 1 Part 1 General

#### 1 1 *Related Work Specified Elsewhere*

##### 1 1 1 Section 05500, Structural and Miscellaneous Steel

#### 1 2 *Quality Assurance*

##### 1 2 1 Include on label of containers

- Manufacturer's name
- Type of paint
- Manufacturer's stock number
- Color
- Instructions for application
- Paint analysis

#### 1 3 *Submittals*

##### 1 3 1 Submit proposed paint and color schedule for approval, including for each item

- Surface to be painted
- Type of paint
- Special thinners required, if any
- Color
- Special surface preparation required
- Material Safety Data Sheet (MSDS)

#### 1 4 *Products Delivery and Storage*

##### 1 4 1 Delivery of Materials -- Except for locally mixed custom colors, deliver materials in sealed containers with labels intact and legible

##### 1 4 2 Storage of Materials

- ##### 1 4 2 1
- The Subcontractor shall provide storage facilities adequate to protect the paint materials and equipment from inclement weather. The storage facilities shall have adequate ventilation. During cold weather, the storage facilities shall be

heated to not less than the minimum recommended by the paint products manufacturer and at no time shall the temperature be below 35°F

- 1 4 2 2 At the end of each work day, all paint materials shall be removed from the work area and properly stored

## 1 5 Job Conditions

### 1 5 1 Environmental Conditions

- 1 5 1 1 Comply with manufacturer's recommendations for environmental conditions under which coatings and coating systems can be applied
- 1 5 1 2 Do not apply finish in areas where dust is being generated
- 1 5 1 3 Provide adequate ventilation when using flammable or toxic paint materials

### 1 5 2 Protection

- 1 5 2 1 Cover or otherwise protect surfaces not being painted
- 1 5 2 2 Furnish fire-retardant protective coverings Do not use flammable material for protective coverings unless special permission is obtained from the Buyer

## 2 Part 2 - Products

### 2 1 Materials

- 2 1 1 Materials selected for painting systems for each type of surface shall be the products of a single manufacturer
- 2 1 2 Other products not specified, but required for the job, shall be commercial products designed for the intended use

### 3 Part 3 - Execution

#### 3 1 Inspection

- 3 1 1 Examine surfaces scheduled to receive paint for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work

#### 3 2 Preparation of Surfaces

##### 3 2 1 Ferrous Metal Surfaces

- 3 2 1 1 Prepare surface in accordance with SSPC-SP2, Hand Tool Cleaning

- 3 2 1 2 Feather edges of sand paint

- 3 2 2 Galvanized Metal - Clean surface in accordance with SSPC-SP2, Solvent Cleaning Dry with clean lint-free cloth

- 3 2 3 Aluminum - Clean surface in accordance with SSPC-SP1, Solvent Cleaning Dry with clean lint-free cloth

#### 3 3 Application

- 3 3 1 Apply paint with suitable brushes, rollers, or spraying equipment

- 3 3 1 1 Do not exceed rate of application recommended by paint manufacturer for type of surface Keep brushes, rollers, and spraying equipment clean, dry, and free from contaminants

- 3 3 2 Comply with recommendation of product manufacturer for drying time between succeeding coats

- 3 3 3 Vary slightly the color of successive coats Tinting shall be uniform

- 3 3 4 Sand dust between each coat to remove defects visible from a distance

3 3 5 Finish coats shall be smooth, free of brush marks, streaks, laps or pileup of paints, and skipped or missed areas. Finished metal surfaces shall be free of skips, voids, or pinholes in any coat when tested with a low voltage. Doors, frames, and finished metalwork or woodwork shall be painted by brush or spray only. Do not roll.

3 3 6 Inspection

3 3 6 1 Do not apply successive coats until each completed coat has been inspected and approved by Contractor.

3 3 6 2 Only inspected coats of paint will be considered in determining the number of coats. Defective or improper previous coatings shall be removed or corrected to the satisfaction of the Contractor.

3 3 7 Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.

3 4 *Cleaning*

3 4 1 Touch up and restore finish where damaged.

3 4 2 Remove spilled, splashed, or splattered paint from all surfaces.

3 4 3 Do not mar surface finish of item being cleaned.

3 5 *Painting Systems and Schedules*

3 5 1 Painting Systems

3 5 1 1 Paint System One (PS-One) for interior-exterior metals

3 5 1 1 1 Prime coat for touch up. Oil-base, rust-inhibitive metal primer.

3 5 1 1 2 Finish - Solvent-type Alkyd enamel, two coats.

3 5 2 Paint Schedules (all colors will be selected by the Contractor when not specified).

3 5 3 Items Not Required to be Painted

|                                   |                |                 |
|-----------------------------------|----------------|-----------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044  |
| OU 7 Seep Collection and Storage  | Section        | Painting, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995    |
| Category                          | Organization   | RPD             |

3 5 3 1 Exterior galvanized metals

## SECTION 13200 - SEEP STORAGE TANKS

### 1 Part 1 General

#### 1.1 Summary

##### 1.1.1 Scope of Work

1.1.1.1 Items specified in this section apply to the seep collection and storage system

1.1.1.2 Furnish and install the following as shown on the drawings to ensure a complete and operable system

##### 1.1.2 Related Sections

1.1.2.1 Section 13210 - Pumping Equipment

1.1.2.2 Section 13215 - Piping

1.1.2.3 Section 13216 - Piping Insulation

#### 1.2 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 ANSI B1.20.1 - Pipe Threads, General Purpose (Inch)

1.2.2 ANSI B16.5 - Pipe Flanges and Flanged Fittings

1.2.3 ANSI C2 - National Electrical Safety Code

1.2.4 ASTM D883 - Definition of Terms Relating to Plastics

1.2.5 ASTM D1998 - Polyethylene Upright Storage Tanks

1.2.6 SSPC 20-1982 - Zinc Rich Primers Type II "Organic"

1.2.7 MIL-P 24441 Rev B - Paint, Epoxy-Polyamide



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|-----------------------------------|----------------|---------------------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044            |
| OU 7 Seep Collection and Storage  | Section        | Seep Storage Tanks, Rev 0 |
| Facility Technical Specifications | Effective Date | January 1995              |
| Category                          | Organization   | RPD                       |

1 2 8 NFPA 70 National Electrical Code

1 2 9 ASTM C177 - Steady State Thermal Transmission Properties by Means of the Guarded Hot Plate

1 2 10 ASTM C273 - Test Method for Shear Properties in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores

1 2 11 ASTM D1621 - Test Method for Compressive Properties of Rigid Cellular Plastics

1 2 12 ASTM D1622 - Test Method for Apparent Density of Rigid Cellular Products

1 2 13 ASTM D1623 - Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Products

1 2 14 ASTM E84 - Surface Burning Characteristics of Building Material

### 1 3 *Submittals*

The following shall be submitted to the Construction Engineer for approval

1 3 1 Detailed tank plans showing location of all tank fittings with material takeoffs prior to installation and as-built record drawings at control closeout

1 3 2 Copies of all laboratory and field test reports within 24 hours of the completion of the test

### 1 4 *Qualifications*

1 4 1 The tank manufacturer shall have been regularly engaged in the design and manufacture of cross linked polyethylene such as specified herein for at least seven (7) years The tank manufacturer's experience will include at least fifteen (15) tank installations of equal or larger capacity than specified herein The tank manufacturer shall be Poly Cal or approved equal

1 4 2 The tank shall be warranted for seven (7) years to be free of defects in material and workmanship

**1 5**     *Delivery, Storage, and Handling*

1 5 1     Deliver, store, protect, and handle tanks in an orderly manner

1 5 2     Prior to shipment, place temporary caps and closures on all tank openings     Maintain in place until installation

**2 Part 2**     **Products**

**2 1**     *General*

2 1 1     Service     Storage of Seep Water

2 1 2     Fluid pH     4 0 - 9 0

2 1 3     Installation     Outdoors, min ambient temp of -20°F, max ambient temp of 120°F

2 1 4     Capacity     13,000 gallons and have an outside diameter of 12 feet and height of 17 feet 2 inches for each primary tank (2)

2 1 5     gallons and have an outside diameter of 14 feet and height of 13 feet 4 inches for each secondary containment tank (2)

2 1 6     Type     Vertical, flat bottom

2 1 7     Design Pressure     Hydrostatic head (atmospheric)

2 1 8     Nameplate     Each major component shall have a nameplate to list the manufacturer's name, address, component type or style, model or serial number, and catalog number on a plate secured to the equipment     Plates shall be durable and legible throughout equipment life and made of stainless steel     Plates shall be fixed in prominent locations with nonferrous screws or bolts

**2 2**     *Tank Design and Materials of Construction*

2 2 1     Single Wall Polyethylene     Tank shall be fabricated to meet the requirements of UV stabilized Type I cross linkable polyethylene and shall be UL listed

50

2 2 2 Tank Connections Piping, vent, or instrument connections to the tank shall be flanged unless noted on the plans as threaded Flange faces shall be drilled to match 150 lb ANSI bolting geometry As a minimum, the tanks shall have 2-inch inlets, 2-inch vents, 2-inch outlets, 2-inch level sensors, and a 3/4-inch leak detection

2 2 3 Tank Anchorage Tank shall be mounted as shown on drawings Tank anchors shall be designed to standards found in UBC-91 (Z=0 15, I=1 25) and for a windspeed of 109 mph

2 2 4 Rain Skirt Rain skirt to prevent rain water from collecting in secondary containment tank (14,750 gal-capacity) Rain skirt to be installed as shown on plans Rain skirt material to be hi-grade 0 062 EPDM Rubber, 60 Duro 1,500 psi tensile strength or approved equal

### 3 Part 3 Execution

#### 3 1 Examination

3 1 1 Prior to tank installation, verify that grade surface has been properly prepared

3 1 2 Verify that all tank openings are properly located as fabricated

#### 3 2 Installation

3 2 1 Install tanks in accordance with manufacturer's instructions

3 2 2 Tanks shall be installed in as level a condition as possible, not to exceed 1/4-inch slope as measured across the entire tank length

#### 3 3 Integrity Test

3 3 1 After installation is complete, tank shall be field leak tested

3 3 2 Tanks shall be filled with water and checked for leakage over an eight-hour period via visual leak detection No amount of leakage shall be acceptable

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Pumping Equipment, Rev 0  
January 1995  
RPD

## SECTION 13210 - PUMPING EQUIPMENT

### 1 Part I General

#### 1 1 Section Includes

##### 1 1 1 Scope of Work

1 1 1 1 Items specified in this section apply to the seep collection and storage system

##### 1 1 2 Related Sections

1 1 2 1 Section 13215 - Piping

#### 1 2 Submittals

The following shall be submitted by the Construction Subcontractor to the Construction Engineer for approval

1 2 1 Spare Parts Data The Construction Subcontractor shall furnish spare parts data for each different item of materials and equipment specified The data shall include a complete list of parts and supplies, with current unit prices and source of supply

1 2 2 Operating and Maintenance Instructions Operating instructions outlining the step-by-step procedures required for system start-up and operation shall be furnished The instruction shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features

1 2 3 Maintenance instructions listing routine maintenance procedures and possible breakdowns and repairs shall be furnished The instructions shall include simplified diagrams for the system as installed

1 2 4 Pump Characteristic Curves Pump characteristic curves showing capacity in gpm, head, and pumping horsepower from 0 gpm to 110 percent (100 percent for positive displacement pumps) of design capacity shall be submitted

**1 3    *General Requirements***

- 1 3 1    **Standard Products**    Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use at least 2 years prior to bid opening
- 1 3 2    **Nameplates**    Each pump shall have the manufacturer's name or trademark on a corrosion-resistant nameplate securely affixed in a conspicuous place    The manufacturer's name or trademark may be cast integrally with, stamped, or otherwise permanently marked upon the item of equipment    Such other information as the manufacturer may consider necessary to complete identification shall be shown on the nameplate
- 1 3 3    **Verification of Dimensions**    The Construction Subcontractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Construction Engineer of any discrepancy before performing the work

**1 4    *Qualifications***

- 1 4 1    **Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience**    Documentation shall be made available to the Construction Engineer upon request

**1 5    *Delivery and Storage***

- 1 5 1    **All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants**

**2    *Part 2    Products***

**2 1    *Submersible Pump***

- 2 1 1    **Submersible pump shall be capable of handling landfill seep water with solids to ½" diameter and shall be capable of running dry for extended periods**
- 2 1 2    **Pump Service**    Landfill seep water with pHs ranging from 4 to 9, and total suspended solids (TSS) from 500 to 17,000 mg/L

- 2 1 3 Design Operating Point 26 gpm flow, 56 feet total dynamic head
- 2 1 4 Operating Point 10 gpm flow, 79 feet total dynamic head
- 2 1 5 Operating Point 30 gpm flow, 48 feet total dynamic head
- 2 1 6 Impeller Type Enclosed, single vane, 4 62 inch diameter
- 2 1 7 Discharge 2 inch NPT
- 2 1 8 Motor Type Submersible, 3,450 rpm, Electrical 460 V/3 PH/ 60 Hz, 0 5 HP
- 2 1 9 Pump Control Manual, automatic interlock and low-level shut-off

**2 2 Pump Materials of Construction**

- 2 2 1 Submersible pump shall be fabricated of cast iron, Class 30 Fasteners, internal valve seats, and bearings shall be fabricated from manufacturers standard materials
- 2 2 2 Pump shaft shall be of adequate size and strength to transmit the full driver horsepower with a liberal safety factor

**2 3 Electrical Work**

- 2 3 1 Electrical motor-driven equipment specified herein shall be installed complete with motors and controls

**3 Part 3 Execution**

**3 1 Equipment Installation**

- 3 1 1 Pumping equipment and appurtenances shall be installed in the position indicated and in accordance with the manufacturer's written instructions All appurtenances required for a complete and operating pumping system shall be provided, including such items as piping conduit, valves, pumps, drivers, power supply, and controls

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Pumping Equipment, Rev 0  
January 1995  
RPD

3 2 *Field Testing and Adjusting Equipment*

3 2 1 Operations Test Prior to acceptance, an operational test of all pumps, drivers, and control systems shall be performed to determine if the installed equipment meets the purpose and intent of the specifications Tests shall demonstrate that the equipment is not electrically, mechanically, structurally, or otherwise defective, is in safe and satisfactory operating condition, and conforms with the specified operating characteristics Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, proper alignment, excessive noise levels, and power consumption

3 2 2 Retesting If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted

55

EG&G Rocky Flats Plant  
OU 7 Seep Collection and Storage  
Facility Technical Specifications  
Category

Manual  
Section  
Effective Date  
Organization

RF/ER-94-00044  
Piping, Rev 0  
January 1995  
RPD

## SECTION 13215 - PIPING

### 1 Part 1 General

#### 1 1 Summary

##### 1 1 1 Scope of Work

1 1 1 1 Items specified in this section apply to the seep collection and storage facility

1 1 1 2 Furnish and install the following as shown on the drawings to ensure a complete and operable system double contained polypropylene piping, PVC piping

##### 1 1 2 Related Sections

1 1 2 1 Section 02200 - Earthwork

1 1 2 2 Section 13216 - Piping Insulation

#### 1 2 References

1 2 1 D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

1 2 2 D2464 - Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

1 2 3 D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

1 2 4 D2467 - Socket-type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

1 2 5 A307 - Specification for Carbon Steel Externally Threaded Standard Fasteners

1 2 6 D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

1 2 7 D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings



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|-----------------------------------|----------------|----------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044 |
| OU 7 Seep Collection and Storage  | Section        | Piping, Rev 0  |
| Facility Technical Specifications | Effective Date | January 1995   |
| Category                          | Organization   | RPD            |

1 2 8 F656 - Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

1 2 9 ASTM D4101 - Black UV Stabilized Block Co-polymer polypropylene pipe

1 2 10 ASTM D2657 - Butt Welding Polyolefin pipe

### 1 3 *Submittals*

The following shall be submitted by the Construction Subcontractor to the Construction Engineer for approval

1 3 1 Piping Plan and Elevation Drawings Provide for approval dimensioned plan and elevation drawings indicating lengths, sizes, and routing of piping Include sections as required to detail control valve piping, pump suction and discharge piping, or other complicated piping assemblies

1 3 2 Product Data Provide data on pipe materials, pipe fittings, valves, and accessories Provide manufacturer's catalog information, including installation instructions

1 3 3 Pressure Testing Log Provide pressure test record for each piping system, including the following minimum information line designation number, date of test, type of test, pressure applied, length of time at test pressure, tested by, and any comments

### 1 4 *Qualifications*

1 4 1 Installer Company specializing in performing the work of this section with a minimum of three years of documented experience Documentation shall be made available to the Construction Engineer upon request

### 1 5 *Delivery and Storage*

1 5 1 Deliver, store, protect, and handle products to site in an orderly manner

1 5 2 Accept valves on site in shipping containers with labeling in place Inspect for damage

1 5 3 Provide temporary end caps and closures on piping and fittings Maintain in place until installation

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|-----------------------------------|----------------|----------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044 |
| OU 7 Seep Collection and Storage  | Section        | Piping, Rev 0  |
| Facility Technical Specifications | Effective Date | January 1995   |
| Category                          | Organization   | RPD            |

- 1 5 4 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system

1 6 *Environmental Requirements*

- 1 6 1 Do not install underground piping when bedding is saturated or frozen

**2 Part 2 Products**

2 1 *Double Contained Polypropylene Piping*

- 2 1 1 Piping 2 inch through 4 inch Black, ASTM D-4101
- 2 1 2 Fittings All sizes Molded butt fusion, ASTM D-2657, 2 inch through 4 inch
- 2 1 3 Flanges Fitted with dual O-rings to simultaneously seal both the primary and secondary fluid passages
- 2 1 4 Gaskets Gaskets shall be 1/16 inch EPDM fullface type in accordance with ANSI B16 21
- 2 1 5 Bolts All sizes Stud bolt, stainless steel, ASTM A193 Gr B8, nuts, heavy hex, alloy steel ASTM A194 Gr 8, washers, ANSI B18 22 1 Type B, 304 Narrow Series, stainless steel
- 2 1 6 Joining Method All double contained polypropylene pipe and fittings shall be joined by thermal butt fusion method as recommended by pipe manufacturer
- 2 1 7 Valves

2 1 7 1 Ball Valves

|           |   |
|-----------|---|
| Type      | Ball, True Union                                |
| Pressure  | 150 psig @ 73°F                                 |
| Standards | ASTM D-1785                                     |
| Ends      | ANSI Class 150, Flanged, Flat Faced, ANSI B16 5 |
| Body      | PP, Type I, ASTM D-1246                         |
| Seat      | Teflon  |
| Seal      | Viton   |
| Operator  | Handle, Manufacturer's Standard                 |

58

## 2 1 8 Ball Valves

|              |   |
|--------------|---|
| Type         | Stainless steel lockable ball valve   |
| Pressure     | 150 psig @ 273°F  |
| Standards    | Class 150, ANSI B16 34, ANSI<br>B16 10  |
| Ends         | Class 150, flanged  |
| Body         | 316 stainless steel   |
| Insert       | 316 stainless steel   |
| Ball         | 316 stainless steel   |
| Stem Seal    | TFE   |
| Stem         | 316 stainless steel   |
| Seat         | TFE   |
| Seals        | TFE   |
| Operator     | Stainless steel handle  |
| Manufacturer | Watts, 2" Series 2500, stainless steel<br>lockable ball valve or approved equal |

2 1 9 All underground valves and similar items must be secondarily contained with a containment box

### 2 1 9 1 Containment Box Specifications

- 1 Materials of construction shall be suitable for the fluid service intended. The box itself shall be of the same material as the inner and outer piping of the system. The box top, which supports the valve stem, shall be made of 1" thick black polypropylene.
- 2 The pressure rating of the containment box shall be 10 psi.
- 3 The containment boxes shall be adequately sized so as to fully contain the 2" ball valves shown on the drawings.
- 4 The containment boxes shall be manufactured by TFI International, Inc. or approved equal.

## 2 2 PVC Process Piping

### 2 2 1 Piping

- 2 2 1 1 ½-inch through 2-inch Schedule 80, PVC, Class 12454-B, threaded or plain ends, in accordance with ASTM D-1785
- 2 2 1 2 2½-inch through 10-inch Schedule 40, PVC, Class 12454-B, plain ends, in accordance with ASTM D-1785 (Schedule 80 in threaded)

2 2 2 Fittings

2 2 2 1 1/2-inch through 2-inch Type 1, Grade 1, PVC, Class 12454-B, Schedule 80,  
screwed or socket

2 2 2 2 3-inch and larger Type 1, Grade 1, PVC, Class 12454-B, Schedule 40,  
socket

2 2 3 Flanges

2 2 3 1 1/2-inch and larger Type 1, Grade 1, Class 150, flat face, PVC, Schedule 80,  
socket

2 2 4 Unions

2 2 4 1 1/2-inch through 2-inch Type 1, Grade 1, PVC, Schedule 80, socket or  
screwed

2 2 4 2 3-inch and larger Type 1, Grade 1, PVC, Schedule 80, socket

2 2 5 Bolting - All Sizes Stud bolt, stainless steel, ASTM A193, Gr B8, Class 1, nuts, heavy  
hex, stainless steel ASTM A194, Gr 8, washers, ANSI B 18 22 1 Type B, Narrow Series,  
304 stainless steel

2 2 6 Gaskets - All sizes 1/8-inch neoprene, full face, 50 - 70 durometer A, Class 150

2 2 7 Cement for Socket Joints - PVC solvent cement in accordance with ASTM D2564 and  
D2855 and as recommended by the manufacturer of the pipe and fittings

2 2 8 Primer - Primer as recommended by the manufacturer of the pipe and pipe fittings

2 2 9 Valves

2 2 9 1 Ball Valves 1021

Type  
Pressure  
Standards  
Ends  
Body

Ball, True Union  
150 psi @ 73°F  
ASTM D-1785  
Socket, ASTM D-2467  
PVC, ASTM D-1784

|         |                   |                             |
|---------|-------------------|-----------------------------|
|         | Ball              | PVC, ASTM D-1784            |
|         | Trim              | ---                         |
|         | Stem              | ---                         |
|         | Seat              | Teflon (TFE)                |
|         | Seal (or Packing) | Viton                       |
|         | Bonnet            | ---                         |
|         | Operator          | Lever                       |
| 2 2 9 2 | Check Valves      |                             |
|         | Type              | Check Swing                 |
|         | Pressure/Temp     | 50 psi @ 140°F              |
|         | Cap Type          | Bolted                      |
|         | Ends              | Threaded                    |
|         | Body              | PP (Polypropylene) or Steel |
|         | Seat              | EPDM                        |
|         | Seals             | EPDM                        |

### 3 Part 3 Execution

#### 3 1 General

- 3 1 1 The Construction Subcontractor shall furnish all tools equipment, materials, and supplies and perform all labor required for furnishing the installation, testing, and flushing of all piping and appurtenances as shown on the drawings and specified herein
- 3 1 2 The work of this section shall include the furnishing, installation and testing of pipe, pipe supports, fittings, specials, and all required appurtenances as shown on the drawings and as required to make the entire piping system operable within the treatment system
- 3 1 3 All pipes, fittings, couplings, and appurtenant items shall be new, free from defects of contamination, and wherever possible, be the standard product of the manufacturer They shall be furnished in pressure or thickness classes as specified or shown
- 3 1 4 The different kinds of buried piping shall be installed in accordance with the drawings, procedures, and methods contained within this specification Such procedures and methods shall conform to or exceed the minimum requirements of the pipe manufacturer and shall be as supplemented by the provisions specified herein The interior of the pipe, fittings, and couplings shall be clean and free from contamination when installed Effective means shall be taken to prevent the entrance of foreign matter following

installation Where fittings are omitted from the drawings, they shall be the same size as the piping and in all cases shall conform to the piping code requirements

- 3 1 5 All pipe shall be carefully placed and supported at the proper lines and grades, and where practicable, shall be sloped to permit complete drainage Piping run shown on the drawings shall be followed as closely as possible, except for minor adjustment, to avoid architectural and structural features If reallocations are required, they shall be subject to the approval of the Construction Engineer
- 3 1 6 In the event that obstructions not shown on the drawings are encountered during the progress of the work that will require alterations to the drawings, the Construction Engineer will have the authority to change the drawings and order the necessary deviations from the line or grade The Construction Subcontractor shall not make any deviation from the specified line or grade without approval by the Construction Engineer Should any deviation in line or grade be permitted by the Construction Engineer for the convenience of the Construction Subcontractor, any additional costs for thrust blocks, valves, blow-off assemblies, extra pipe footage, or other additional costs shall be borne by the Construction Subcontractor
- 3 1 7 Storage and Handling During storage, handling, and transporting, every precaution shall be taken to prevent injury to pipe Pipe shall be handled only by means of approved hooks on ends of sections, by means of fabric slings, or by other methods approved by the Engineer for the pipe used
- 3 1 8 Verification of dimensions All dimensions essential to the correct locations of the pipe, or fit of piping at equipment and valves, or to the avoidance of obstructions or conflict with other improvements, shall be accurately determined by the Construction Subcontractor prior to fabrication of the piping involved Any required change from the nominal locations shown on the drawings shall be made by the Construction Subcontractor and shall be included as a part of the work hereunder and will be subject to approval of the Construction Engineer
- 3 1 9 Construction Subcontractor shall provide non-conducting dielectric connections wherever joining dissimilar metals

|                                   |                |                |
|-----------------------------------|----------------|----------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044 |
| OU 7 Seep Collection and Storage  | Section        | Piping, Rev 0  |
| Facility Technical Specifications | Effective Date | January 1995   |
| Category                          | Organization   | RPD            |

3 1 10 All valves shall be installed with stems upright and horizontal, not inverted Valve labels shall be applied to valves such that they are easily visible for the "normal" point of view Valve handles shall be labeled with function and arrows indicating which direction to turn the handle to "open" or "close" the valve

3 1 11 Piping shall be installed per manufacturer's installation instructions

### 3 2 *Buried Pipe Installation*

3 2 1 Buried piping shall be laid to the grades and alignment shown on the drawings and all trenching, bedding, and backfilling shall conform to Section 02200, Earthwork

3 2 2 The foregoing requirements shall govern the work, regardless of the type of pipe installed unless a more stringent requirement is specified When the work is not in progress, open ends of piping and fittings shall be securely closed The piping shall be placed when trench and weather conditions are suitable No pipe shall be laid in water, and responsibility for the diversion of drainage and dewatering of trenches during construction, including meeting all safety requirements, shall be borne by the Construction Subcontractor All piping in place shall be approved by the Construction Engineer as to line, grade, bedding, and proper joint construction before backfilling In all backfilling operations, the Construction Subcontractor shall be responsible for preventing damage to or misalignment of the pipe

3 2 3 Coverage Unless otherwise shown on the drawings, all buried piping shall have a coverage of at least 36 inches between the top of the pipe and the finished surface, and all buried conduits shall have a coverage of at least 18 inches between the top of the conduit and finished surface

3 2 4 Variations from the pipeline grade and alignment may be allowed to accommodate fabrication with the approval of the Construction Engineer All changes of grade shall require the approval of the Construction Engineer on the installation drawings

### 3 3 *Above Ground Piping Installation*

3 3 1 All piping shall be installed in accordance with the erection drawings The horizontal piping shall be level except where otherwise shown on specified, parallel lines shall be

grouped on the same horizontal or vertical plane wherever possible. Vertical piping shall be plumb and the entire piping configuration shall allow adequate clearances for convenient access for painting and preventive maintenance of valves. Piping shall clear obstruction, preserve headroom, and keep openings and passageways clear. If structural difficulties or other work prevent the running of pipes or the setting of equipment at the point indicated on the drawings, the necessary minor deviations therefrom, as determined by the Construction Engineer, will be allowed and shall be shown on the erection drawings to be furnished. Except as otherwise shown or specified, piping installation work shall be in accordance with the printed or written recommendations of the manufacturer of the product involved for the given conditions.

- 3.3.2 Horizontal and vertical pipes shall be anchored securely by means of pipe hangers or supports. Sufficient unions shall be provided to facilitate disassembly of the pipe. Pipe ends shall be reamed to the full bore of the pipe. Threads shall conform to the requirements of ANSI B1.2-1983. In making up threaded joints, teflon tape shall be applied to the male ends only.
- 3.3.3 The Construction Subcontractor shall provide pipe hangers, brackets, saddles, samples, and other supports as necessary to support all dead loads, live loads, and dynamic loads experienced by the piping and appurtenances. Pipe supports conforming to these requirements shall be supplied whether or not shown on the drawings. Supports shall be provided at, but not limited to, points of change in direction, both sides of flexible joints, dead ends, and maximum spacing as defined by this specification. Supports shall be designed to standards in UBC-91 Section 2336 and (36-1) ( $Z=0.15$ ,  $I=1.25$ ) and for a wind speed of 109 mph. In general, all piping should be supported from the ground or building walls as much as feasible.
- 3.3.4 Where specified or shown, bolts, stud bolts, rods, yokes, and nuts hangers and supports shall be of steel. Where submerged in process fluids or where located in covered manholes, boxes, etc., bolts, stud bolts, rods, yokes, and nuts of hangers and supports shall be of silicon bronze. Bolts shall not be less than 1/4-inch diameter unless otherwise called for on the drawings.
- 3.3.5 Design. Hangers and supports shall (1) be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions and (2)



have springs where necessary. Hangers and supports shall be of standard design where possible and be best suited for the service required, approved by the Construction Engineer. Where required, they shall be screw adjustable after installation. Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy.

### 3.4 Testing

3.4.1 Leak testing of piping system integrity shall be by either hydrostatic or pneumatic test methods listed below:

3.4.1.1 2-inch and 4-inch double contained polypropylene at 125 psig

3.4.1.2 PVC Pipe (All sizes) - Hydro at 125 psig

3.4.2 Construction Subcontractor shall identify piping components, i.e., meters, instruments, that may not be designed for full hydrotest pressure and make provisions for testing the piping system with those components removed, as required.

3.4.3 Leaks shall be located, repaired, and the line retested to the satisfaction of the Construction Engineer.

3.4.4 The hydrostatic testing of both the inner and outer piping shall be performed as outlined in the uniform plumbing code Section 318 and as described below. After the pipe has been joined, it should be filled with water, taking care to bleed off any trapped air. It should then be subjected to a hydrostatic test pressure of a maximum of 1.5 times the system design pressure, for a maximum period of three (3) hours. During this time, the pipe is maintained at the test pressure by the periodic addition of make-up water to compensate for the initial stretching of the pipe. The line pressure-tightness is determined by visual examination. It is not necessary, therefore, to keep track of the make-up water. Every fused joint should be examined and any joint that shows any leakage must be repaired and then retested.

3.4.5 Warning Do not proceed with hydrostatic pressure tests above ground unless the construction supervisor has taken appropriate safety precautions.

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|-----------------------------------|----------------|----------------|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044 |
| OU 7 Seep Collection and Storage  | Section        | Piping, Rev 0  |
| Facility Technical Specifications | Effective Date | January 1995   |
| Category                          | Organization   | RPD            |

3 4 6 Pressure drops due to the thermal contraction are acceptable, if the pressure returns to the original test pressure after 2 hours

### 3 5 *System Flushing*

3 5 1 After tests are completed, piping shall be flushed. In general, sufficient water shall be used to produce a minimum water velocity of 2.5 feet per second through piping being flushed. Flushing shall be continued until discharge water shows no discoloration. System shall be drained at low points.

3 5 2 Construction Subcontractor shall not flush the 4-inch containment pipe as it is important to keep the annulus as dry as possible.

## SECTION 13216 - PIPING INSULATION

### 1 Part 1 General

#### 1.1 Scope of Work

1.1.1 Items specified in this section apply to the leachate collection and storage system

1.1.2 Finish and install the following as shown on the drawings to ensure a complete and operable system: pipe insulation's, jackets and accessories, and heat tracing

#### 1.2 Related Sections

1.2.1 Section 13215 - Piping

#### 1.3 References

1.3.1 ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate

1.3.2 ASTM C195 - Mineral Fiber Thermal Insulation Cement

1.3.3 ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation

1.3.4 ASTM C547 - Mineral Fiber Performed Pipe Insulation

1.3.5 ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)

1.3.6 ASTM C921 - Properties of Jacketing Materials for Thermal Insulation

1.3.7 ASTM E84 - Surface Burning Characteristics of Building Materials

1.3.8 NFPA 70 - National Electrical Code

#### 1.4 Submittals

1.4.1 Electric Heat Tracing Sizing Calculations

**1 5     *Quality Assurance***

1 5 1     Insulation shall be installed per manufacturer's installation instructions

**1 6     *Qualifications***

1 6 1     Applicator   Company specializing in performing the work of this section with a minimum of three years of experience   Documentation shall be made available to the Construction Engineer upon request

**1 7     *Delivery and Storage***

1 7 1     Deliver, store, protect, and handle products to site in an orderly manner

1 7 2     Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness

1 7 3     Store insulation in original wrapping and protect from weather and construction traffic

1 7 4     Protect insulation against dirt, water, chemical, and mechanical damage

**1 8     *Environmental Requirements***

1 8 1     Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements

1 8 2     Maintain temperature during and after installation for minimum period of 24 hours

**2   Part 2     **Products****

**2 1     *Pipe Insulation***

2 1 1     All above ground piping outside enclosures shall be insulated

2 1 2     2-inch double contained pipe shall have 2-inch thick, urethane insulation, Tymer or approved equal

2 1 3     Insulation shall be covered with a smooth finish aluminum vapor barrier jacket of 016 inch thick stucco embossed, Pablo or approved equal

2 1 4 Jacket shall be attached with 3/8-inch-wide, .015-inch thick aluminum bands

2 1 5 Jacket shall be joined with longitudinal slip joints and 2-inch laps

## 2 2 Heat Tracing

2 2 1 The Construction Subcontractor shall provide heat tracing cable and all accessories and completely install the entire heat tracing system so that it will provide complete freeze protection for pipelines (including valves, flanges, etc ) as shown on project drawings

2 2 2 Fluid in pipelines is seep water with limited quantity of contaminants

2 2 3 Approximate minimum water temperature desired is 40°F

2 2 4 Minimum expected ambient temperature is minimum -20°F

2 2 5 All pipelines that are to be heat traced are made of either PVC or polypropylene and are insulated as described in the appropriate specification sections of this Subcontract

2 2 6 The heat tracing system includes heat tracing cable, end seals, cable ties, fittings, supports, hardware, thermostats, and any other required components All equipment shall be Glas-Col heat tracing, or approved equal

2 2 7 Heat tracing cable shall be self-limiting type that automatically limits its own maximum temperature Below maximum temperature, the heater shall regulate its own heat output The built-in temperature control shall be accomplished by a semi-conductive heating material whose electrical resistance varies with its temperature

2 2 8 Heat tracing cable shall have two (2) copper bus wires, a self-regulating semi-conductive core, thermoplastic outer jacket, tinned copper overbraid, and an over jacket of fluoropolymer Heat tracing Glas-Col heat tracing Freez Stop R or approved equal with an output of 8 watts per foot at 50°F

2 2 9 Each heat tracing circuit shall operate at 120 V AC and 60 Hz Control shall be by an in-line ambient sensing thermostat controller, Glas-Col heat tracing type 104B-AC220 or 104A PL712 or approved equal The thermostat controller shall become energized at a temperature of 40°F

### **3 Part 3 Execution**

#### **3 1 Examination**

3 1 1 Verify that piping has been tested before applying insulation materials

3 1 2 Verify that surfaces are clean, foreign material removed, and dry

#### **3 2 Installation**

3 2 1 Install materials in accordance with manufacturer's instructions

3 2 2 Provide vapor barrier jackets, field applied

3 2 3 Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations

3 2 4 Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints

3 2 5 Install galvanized insulation shields between aluminum jacket and pipe supports

3 2 6 Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe Size large enough to enclose pipe and heat tracer Cover with aluminum jacket with seams located on bottom side of horizontal piping

#### **3 3 Tolerance**

3 3 1 Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicate

## SECTION 16050 ELECTRICAL MATERIALS AND INSTALLATION

### Part 1 General

#### 1-1 Scope

- A This specification covers the essential information for the Subcontractor to furnish all necessary labor, materials, tools, equipment, associated controls and services as required for the installation of a complete and operable electrical system as outlined and described in this specification and as shown on the project specification drawings
- B This specification shall in no way supersede any specific instruction or requirement given by the Manufacturer for the erection of equipment or by the Manufacturer's representative on site where he is directly responsible for the erection of that equipment to the satisfaction of Contractor
- C Any conflicts, ambiguities or unforeseen conditions which may arise and are not covered by this specification shall be resolved in writing between the Subcontractor and Contractor before any work is undertaken or completed

#### 1-2 Systems

- A The electrical systems and their characteristics are as follows
  - 1 Primary Power 480 Volts, three phase, 60 Hertz, three wire, grounded
  - 2 Not used
  - 3 Power Utilization (200 HP and below) 460 Volts, three phase, 60 Hertz, three wire, solidly grounded neutral
  - 4 Power Utilization (below 1/2 HP) 120 Volts, single phase, 60 Hertz, two wire, solidly grounded neutral
  - 5 Lighting 208 Volts,

single phase, 60 Hertz,

6 Control

120 Volts, single phase,  
60 Hertz, two wire,  
solidly grounded  
neutral

7 Not used

#### 1-3 Rules and Standards

- A All work shall be done in strict conformance with all requirements set forth by applicable municipal and local ordinances, state codes, National Electrical Safety Code, National Electrical Code (NEC), and either OSHA for all non-mining industrial facilities or MSHA for all mining and surface work areas of mine facilities
- B All the electrical equipment and materials furnished under this specification shall be designed, built, rated, and tested in accordance with the latest applicable code and/or standard
  - 1 American National Standards Institute (ANSI),
  - 2 Institute of Electrical and Electronic Engineers (IEEE),
  - 3 Instrument Society of America (ISA),
  - 4 National Electrical Manufacturer's Association (NEMA),
  - 5 National Electrical Code (NEC),
  - 6 Underwriter's Laboratories (UL),
  - 7 Insulated Cable Engineers Association (ICEA),
  - 8 Illuminating Engineering Society (IES)

#### 1-4 Drawings and Reference Information

- A In case of conflicts or inconsistencies between the drawings, reference information and specifications, or in case of discrepancies, omissions, and/or errors, the matter shall be submitted immediately to Contractor, in writing, for resolution
- B The Subcontractor shall also review architectural, civil, structural, piping, ventilating plans, and shall adjust his work to conform to all conditions shown thereon. Discrepancies shown on different plans, or between plans and specifications, and any installation that violates the requirements of any codes, shall be promptly brought to the attention of Contractor
- C Shop Drawings Within ample time to prevent delays in construction and prior to



fabrication, the Subcontractor shall submit to Contractor for approval, shop drawings on all fabricated work being furnished and installed under this specification. Subcontractor shall allow Contractor one week for such approvals.

- D **As-Built Drawings** The Subcontractor shall, upon completion of the work, furnish the Contractor with two (2) complete sets of "red-marked" as-built prints showing the final locations of all electrical components and equipment and all changes to the one-line, elementary and interconnection diagrams, and to any main or cable tray or conduit runs. The as-built drawing set shall be maintained and up-dated on a daily basis and available for inspection upon demand of Contractor. These prints shall be marked exactly as the equipment has been installed.

#### 1-5 Scope of Work

- A The following listing, for the convenience of the Subcontractor, indicates the main or areas of work involved for a complete installation.

- 1 Not used
- 2 Provide and install all alternating current branch power and control circuit wiring and auxiliaries from the service weatherhead & disconnect switch to all utilization, control and protective apparatus and devices as shown on the drawings and/or required for a complete and operable system.
- 3 Provide and install lighting distribution and lighting systems wiring and raceway systems.
- 4 Provide and install complete grounding system, including all grounding ties between the ground grid, loops, buses and non-current carrying parts of electrical apparatus, conduit, tray, building and supporting steel, etc as required for a complete and operable system.
- 5 Install all material and apparatus furnished by Contractor, as shown on the contract drawings, unless specifically herein excluded.
- 6 Not used
- 7 Not used
- 8 Not used
- 9 Acceptance testing as outlined in Section 3-10 of this specification.

B Not used

C Installation Schedule

Subcontractor must work closely with the General Subcontractor and/or Contractor during fabrication and installation of new equipment, together with the rearranging and tie-in to existing equipment, for the purpose of coordinating such work with other operations. Subcontractor shall make no extra charges for having to coordinate with other operations.

1-6 Not used

## Part 2 Materials

2-1 Wires and Cables

- A Each coil or reel of wire and cables furnished by the Subcontractor shall bear a tag containing the underwriter's approval stamp, name of manufacturer, trade designation (if applicable), month and year of manufacture, cable or wire type and construction, and the length of the cable or wire on the coil or reel.
- B Wire and cable for all power distribution and motor branch circuit wiring shall be single conductor, Class B, stranded, annealed, coated copper conductors, code type XHHW, rated 75°C wet or dry locations, with 600 volt class insulation (type THHN-THWN is an acceptable alternative).
- C Lighting distribution, branch circuit, and control circuit wiring shall be single or multiple conductor, stranded, annealed, coated copper conductors of the size required, each contained in a 600 volt class, heat and moisture resistant, code type XHHW, rated 75°C wet or dry locations and an overall nylon or PVC jacket (type THHN-THWN is an acceptable alternative).
- D Analog signal wire for 4-20 mA, 1-5 VDC, or pulse train signals shall be #16 AWG, 19 strand copper, twisted pairs, aluminum/mylar shield with 100% coverage and continuous contact seven strand, #18 AWG, copper drain wire. Each wire shall be insulated with colored PVC (one wire black for negative connection, the other clear or white for positive connection). Multiple pair cables shall have each pair of wires shielded and the cable assembly shall be covered with an overall shield and overall PVC outer jacket. PVC insulation shall be rated at 300 volts.

E Thermocouple extension wire shall be iron-constantan #16 gage ISA type, premium accuracy calibrated single or multiple twisted pairs with an individual shield and overall shield on multiple pairs. Wires shall have 300V PVC insulation and each twisted pair shall have a PVC jacket except for heater areas where high temperature insulation must be used.

F Wire and cable shall be color coded as follows

|                    |   |       |
|--------------------|---|-------|
| Neutral            | - | White |
| <u>DC Circuits</u> |   |       |
| DC Positive        | - | Red   |
| DC Negative        | - | Black |

Insulated Grounding Conductors - Green

All other wire colors shall be at random colors other than those listed below

G All power distribution feeders shall have black insulation and shall be phase coded and permanently identified at each termination point with 1 inch wide color tape bands as 'A,' 'B,' and 'C.'

The colors shall be as follows

|                            |                        |
|----------------------------|------------------------|
| <u>For 208/120 V Power</u> | <u>For 480 V Power</u> |
| Phase A - Black            | Phase A - Brown        |
| Phase B - Red              | Phase B - Orange       |
| Phase C - Blue             | Phase C - Yellow       |
| Neutral - White            | Neutral - White        |

## 2-2 Wire and Cable Connectors and Terminals

- A Solderless connectors shall be used for connecting wire and cable conductors, regardless of size and configuration. The connectors shall be copper, insulated of the ring-tongue type and rated 600 volts and 105°C.
- B Composition or porcelain "wire-nuts" are not acceptable for conductor connection or splicing, except for lighting and convenience receptacle circuits.
- C Splicing and termination materials, such as tapes, compounds, connectors, splicing sleeves, etc., shall be of the highest quality and as recommended by the cable manufacturer, furnished in unit packages which contain sufficient

quantities of the necessary materials for a complete splice or termination

2-3 Conduit

- A All conduits shall be UL approved for the use intended and shall be rigid, hot dipped, galvanized steel, unless otherwise specified
- B Minimum conduit size shall be 3/4 inch trade diameter above ground and 1 inch trade diameter underground
- C Unless otherwise shown on the drawings, conduit for power distribution circuit wiring, installed underground or underfloor, shall be pvc coated, galvanized rigid steel or nonmetallic conduit The nonmetallic conduit shall be Schedule 40 heavy wall PVC conduit designed for concrete encasement

2-4 Junction and Pull Boxes

- A Junction and pull boxes shall be fabricated of sheet steel, unless otherwise specified, with hinged Neoprene or rubber gasketed covers Boxes and covers shall be of the same type and size Screws shall be corrosion resistant Refer to contract drawings and section 2-8-A for enclosure requirements
- B For non-classified process areas surface mounted device boxes shall be cast iron alloy "FS" type with threaded hubs and gasketed cover complete with cast cover plates equipped with spring door covers and watertight gaskets, suitable for the device to be mounted Refer to contract drawings and section 2-8-A for enclosure requirements for other areas

2-5 Grounding System Components

- A All ground wire shall be bare stranded, soft drawn copper, unless otherwise specified
- B Driven rod grounding electrodes shall be cone-pointed, galvanized steel rods, 3/4" x 10'-0" minimum size All ground rods shall have a diameter sufficient to permit driving to the required depth without being bent or damaged All ground rods shall have the length in feet and the manufacturer's trade mark die stamped near the top
- C All underground connections on the grounding network and connections to structural steel or foundation re-bar shall be by exothermic type welding process such as the "Cadweld" process

|                                   |                |  |
|-----------------------------------|----------------|--|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                               |
| OU7 Seep Collection and Storage   | Section        | Electrical Materials and Installation, Rev 0 |
| Facility Technical Specifications | Effective Date | January 95                                   |
| Category                          | Organization   | RPD  |

D All connections to equipment ground bus bars, process vessels and tanks and other surfaces where specified on the drawings shall be made with Burndy type KC connections, or equal

E All connections to conduit stubups shall be made with grounding bushings. Bushings shall be connected together by means of bonding jumpers

#### 2-6 Lighting

A Unless specified otherwise, all general area lighting shall be high pressure sodium lamps with integral temperature-protected ballast and disconnect sockets as shown on the lighting fixture schedule

B Outdoor lighting and floodlighting control units, where required, shall be integral, photoelectric type complete with photoconductive cell, control relay, surge protection, and weatherproof housing

C Not used

D Not used

#### 2-7 Wiring Devices

A Convenience receptacles shall be 120V single phase, unless otherwise specified in the drawing, duplex, two-pole, three-wire, grounding type, rated 20A-125V alternating current, specification grade. These receptacles shall be installed in a sheet steel or plastic cover for flush mounting in control rooms or in a weatherproof cover with spring-loaded cap for the process areas. Also refer to the contract drawings and section 2-8-A for enclosure requirements

#### 2-8 Enclosures

A Enclosures for all electrical equipment shall be suitable for the environment in which they will be located and shall be as shown on the drawings

B Enclosures shall be properly identified as to contents and purpose. Identification shall be by laminated plastic nameplates which yield black characters on a white background

#### 2-9 Heat Trace

- A Electric heat trace cable, if required as shown on the drawings, shall be the self-regulating type, Chemelex "Auto-Trace" type or approved equal Voltage and watts-per-foot shall be specified on the drawings
- B The Subcontractor shall provide the cable, thermostats, connection kits and splice boxes required for a complete system and suitable for the application shown on the drawings

## 2-10 Nameplates, Tags and Markers

- A Nameplates shall be provided by the Subcontractor for
  - 1 All control and power devices mounted inside the control panels or on the cover of the control panels furnished by him Any panel furnished by Contractor shall have nameplates already installed The nameplates are to be mounted adjacent to, not on the device
  - 2 Motor starters, push buttons, pilot lights, safety switches, instruments, thermostats, and all control instrumentation and power devices
  - 3 Power panels, lighting panels and main switchgear
  - 4 Field mounted instruments
- B Nameplates shall be fabricated as follows
  - 1 Nameplate materials shall consist of 3 ply 1/16" laminated plastic with black core for lettering and white background
  - 2 Nameplates shall preferably be fastened with self-tapping #6 screws, 1/4" long, or fastened with epoxy
  - 3 Field mounted instruments shall be provided with a stainless steel nameplate with the Instrument Tag as shown on the P & ID drawings
- C The size of the nameplate and lettering shall be as shown below

| <u>Size</u><br><u>Nameplate</u> | <u>Size</u><br><u>Lettering</u> | <u>Use</u>      |
|---------------------------------|---------------------------------|-----------------|
| 1/2 x 1 1/2 long                | 3/16" high                      | Relays, timers, |

fuses,  
transformers,  
inside control  
cabinets, field mounted  
instruments

9/16" x 3-3/8" long

1/8" high

Push buttons,  
pilot lights,  
etc , mounted  
on control  
stations and  
panels,  
instruments and  
thermostats

1" x 3 1/2" long

3/16" high

Motor starters,  
safety  
switches, power  
and lighting  
panels,  
switchgear,  
control panels

D The nameplate marking and its application shall be as follows

- 1 The device designation as shown on the elementary and connection diagrams This applies to control and power devices such as relays, timers, etc , mounted inside control cabinets furnished by the Subcontractor
- 2 The device designation and description of the item controlled This applies to push buttons, selector switches, pilot lights, timers, etc , mounted on control panels or on control stations, and to motor starters and their disconnect switches
- 3 Limit switches, solenoid valves, or other devices that have insufficient space for nameplates shall be identified by free hand lettering with the corresponding item number on the machine frame with black stencil pencil The size of the lettering shall be selected to suit field conditions

E Markers for wire number identification at all wiring terminal points on motor

control units, control consoles, panelboards, etc , shall be preprinted, heat shrink, sleeve type wire markers

2-11 Materials and Substitutions

- A The Subcontractor shall submit for approval by Contractor, shop drawings accompanied by complete plans, specifications and any other data required for a complete and comprehensive evaluation of any material or devices he wishes to substitute for a specified item

2-12 Device Plates

- A Not used
- B Not used
- C Not used
- D Not used
- E Not used
- F Device plates for receptacles outdoors or indicated as weatherproof shall be Appleton "FSK-WRD" or Crouse-Hinds "WLRD1"
- G Not used
- H Engraved device plates, where required, shall be as manufactured by Sierra Electric Corporation

2-13 Not used

2-14 Receptacles

- A Standard convenience outlets shall be duplex, 3 wire, grounding, 20 amperes, 125 volts, Hubbell "5362" for 120 volt circuits, and 250 volts, Hubbell "5462" for 240 volt circuits
- B Not used
- C Not used



|                                   |                |  |
|-----------------------------------|----------------|--|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                               |
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| Facility Technical Specifications | Effective Date | January 95                                   |
| Category                          | Organization   | RPD  |

D Not used

E Not used

2-15 Not used

2-16 Lighting Panels

A Unless otherwise specified, each lighting panel shall be dead-front, circuit breaker, 120/208 volt, three phase panelboard type in accordance with the drawings and the following

B The panel shall have a NEMA 3R surface mount enclosure The enclosure shall have a door with latch A directory inside the door shall have the panel and all circuit identities neatly typewritten at completion of the contract

C A ground stud bolt shall be provided through the cabinet with a removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground cable

D Not used

E Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped" Breakers indicated as multiple-pole shall be common trip Breakers shall have interrupting ratings not less than 10,000 amperes Handle clips to prevent casual operation of breakers shall be provided for 10 percent (minimum of two) of the breakers and applied to the circuits directed Breakers and provisions for future breakers shall be provided in the quantities, poles, and ampere ratings indicated on the drawings Breakers shall be single pole, 20 amperes, except as indicated otherwise

F The panel shall have main and neutral buses insulated from the cabinet and a ground bus Buses shall be copper with ampere ratings and main lugs or breaker as indicated The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit

2-17 Not used

2-18 Not used

## 2-19 Separately Enclosed Motor Starters

- A Separately enclosed motor starters, unless otherwise specified, shall be full voltage, non-reversing, circuit breaker combination-magnetic motor starters sized as indicated on the drawings
- B The starters shall consist of single or 3 phase, 60 Hz contactors with thermal overloads, 120 volt ac coil, dry type control power transformer where required, and a magnetic motor circuit protector disconnect in a NEMA Type 1 enclosure indoors or NEMA Type 4 stainless steel enclosure outdoors, unless otherwise noted. Control power transformers shall be sized to handle all simultaneous loads
- C Each starter shall include auxiliary contacts as required plus one spare NO and one spare NC contact
- D Magnetic motor circuit protectors shall be single or 3 phase, 600 volt, molded-case circuit breakers with instantaneous trip elements. The breakers shall be manually operated with quick-make, quick-break, trip-free toggle mechanism
- E One thermal overload relay shall be provided in each phase lead. Each starter shall be provided with an external manual reset push button for reset of the thermal overload relays
- F An external manual breaker operating handle with provisions for up to three padlocks shall be provided on each starter. The access door shall be interlocked with the motor circuit protector so the door cannot be opened while the breaker is closed, except by an interlock override
- G The complete starter shall have an interrupting rating of at least 10,000 amperes at 480 volts
- H The Subcontractor shall match control power transformers, overloads, heaters, and sizes of starters to the equipment furnished, which may differ from expected values as indicated on the drawings. Control power transformers shall have both primary leads fused, one secondary lead fused, and one secondary lead grounded
- I All push buttons, selector switches, and lights indicated on the schematics to be provided on or in the starter enclosure shall be heavy-duty, oiltight. Push buttons shall be provided with protective caps when starters are located

outdoors

- J Motor starters shall have engraved or etched legends ("Start", "Stop", etc ) as described on the drawings Motor starters shall have nameplates identifying related equipment, and unit numbers where applicable Nameplates shall be laminated black-over-white plastic with 1/8 inch engraved letters and shall be securely fastened to the motor starter

2-20 Not used

2-21 Not used

2-22 Not used

2-23 Disconnect Switches

- A Unless otherwise specified, each disconnect switch shall be 3 phase, nonfusible, 600 volts, with a continuous current rating as indicated on the drawings
- B Switches located indoors shall have a NEMA Type 1 general purpose enclosure Switches located outdoors shall have a NEMA Type 3R enclosure
- C Switches shall have high conductivity, copper, visible blades, nontearable, positive, quick-make, quick-break mechanisms, and switch assembly plus operating handle as an integral part of the enclosure base Each switch shall have a handle whose position is easily recognizable and capable of being padlocked in the "Off" position with three padlocks The "On" position and "Off" position shall be clearly marked
- D All switches shall be UL listed, horsepower rated, and meet NEMA Specification KS1-1975 Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position
- E All switches shall have front cover-mounted nameplates that contain a permanent record on switch type, manufacturer and catalog number, and horsepower rating An additional nameplate shall be provided to identify the related equipment The additional nameplate shall be engraved or etched, laminated black-over-white plastic, with 1/8 inch letters Both nameplates shall be securely fastened to the enclosure

## 2-24 Lighting and Auxiliary Power Transformers

- A Separately mounted transformers shall be provided in the phases, kVA, and voltages indicated on the drawings. Transformers shall be self-air-cooled, dry type, wall or floor mounted, and enclosed for wiring in conduit. Transformers installed outdoors shall be weatherproof.
- B Transformers shall have a 220°C class insulation system with a 115°C maximum rise rating.
- C Transformers shall be provided with two 2 1/2% full capacity taps above normal and 4 2 1/2% full capacity taps below normal.

## 2-24 Lighting Contactors

- A Contactors located outdoors shall have a NEMA 4 enclosure.
- B Unless noted otherwise on the drawings, single phase lighting contactors shall be two pole with a 30 amp rating. Contactor shall be electrically held.
- C Unless shown otherwise in a lighting schematic on the drawings, lighting contactors will be fed from a circuit breaker mounted in a lighting panel, and the control voltage shall be 120VAC 60HZ. The control voltage shall be supplied by an integrally mounted control transformer complete with primary and secondary fuses.
- D The lighting contactor shall be provided with the following:
  - 1 Cover mounted hand-off-auto (NEMA 4 or oiltight as applicable)
  - 2 Auxiliary contacts - 1 N O and 1 N C
  - 3 120VAC photocell suitable for remote mounting. Photo cell shall be complete with weatherproof enclosure.

## Part 3 Execution

### 3-1 Wires and Cables

- A Radius of cable bends shall equal or exceed the minimum values required by the manufacturer or the NEC.

|                                   |                |  |
|-----------------------------------|----------------|--|
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| OU7 Seep Collection and Storage   | Section        | Electrical Materials and Installation, Rev 0 |
| Facility Technical Specifications | Effective Date | January 95                                   |
| Category                          | Organization   | RPD  |

- B All wire and cable shall be installed in raceway systems No wire or cable shall be installed until a raceway system is completed
- C Instrumentation, communication, thermocouple and other low level signal circuits shall not be installed in the same conduit or duct, outlet box, junction box, or pull box with power or lighting circuits
- D Control wires and cables shall not be spliced at any location Where it is necessary to tap or branch from control conductors, "terminal" junction boxes shall be provided for this purpose Boxes shall be provided in accordance with this specification
- E The use of wire and cable pulling lubricants other than powdered soapstone or compounds approved by the National Electrical Code is not permissible
- F All feeder cable shall be continuous from origin to termination without running splices in intermediate pull boxes or splicing chambers
- G Where feeders consisting of more than one conductor per phase pass through pull boxes or panels, the individual phase conductors shall be grouped together with conductors of the other two phases to reduce reactance effect
- H All power cables shall have phase permanently identified as A, B, and C Tape markers should be located within 12 inches of end of cable The color code for power distribution is shown in section 7 1 7

### 3-2 Wire and Cable Connections and Terminations

- A No more than two conductors shall be installed on an individual terminal screw
- B All motor leads, power, branch and control circuit conductors shall be tagged with wire identification numbers at each termination such as motor control centers, starters, operator stations, control panels, etc , as specified on the project specification schematic and wiring diagrams
- C Wire connectors consisting of an insulator cap and spring or set screw insert may only be used for taps and splices in lighting and convenience receptacle branch circuit wiring Pigtail-type taps and splices shall only be made above grade in appropriate boxes that are accessible
- D Where conductors for control wiring and instrumentation power supply

wiring are to be connected to binding screw terminal boards, the conductors shall be provided with self-insulated ring or fork tongue pressure terminals. However, all field installed terminal strips shall be compression type with suitable legend space at each terminal.

- E Connectors and terminals shall be securely fastened with tools designed to bring uniform pressure on all sides of joint and shall not loosen under normal vibration or strain. Insulation at wire terminal ends shall be stripped carefully to avoid nicking conductors.
- F All splices and terminations of 600 volt wire and cable requiring insulation shall be insulated with four (4) half-lapped layers of Scotch #33 electrical tape. Rubber and friction tape shall not be used.
- G Conductors terminating at each wired outlet shall be left not less than eight (8) inches long at their outlet fitting.
- H Not used.

### 3-3 Raceways, Cable Tray, and Accessories

- A Not used.
- B Exposed conduit shall be installed parallel with or at right angles to walls, columns and beams, and grouped wherever possible. All conduit shall be swabbed out by pulling a cloth swab through the conduit run before pulling wire in.
- C Not used.
- D Not used.
- E Not used.
- F Not used.
- G Not used.
- H All heavy wall, steel conduit joints shall be made with standard rigid conduit couplings and the ends of the conduits shall be cut square, reamed and joined wrench tight in the couplings.

- I Threads cut on conduit in the field shall have the same effective length and the same thread dimensions and taper as specified for factory cut conduit  
Running threads shall not be permitted
- J Bends of rigid conduit shall be so made that the conduit will not be injured, shall be free of indentations or elliptical section and shall, at no point, effectively reduce the internal diameters of the conduit
- K Not used
- L Not used
- M Liquid tight, flexible metallic conduit, as herein specified, shall be employed at all apparatus or devices subject to vibration, movement for belt adjustment, operational inspections, etc
- N Conduit runs shall be installed as a complete, continuous system without wires, and shall be mechanically and electrically connected to all boxes and fittings The boxes and fittings shall be so connected that electrical continuity from one conduit to another will be secured
- O Not used
- P Not used
- Q Not used
- R All multiple conduit bends which are in the same plane shall be made concentric
- S Metallic conduit run into metal boxes or cabinets without threaded hubs shall utilize Myers hub-type connectors A Locknut inside and out is not acceptable
- T Not used
- U Not used
- V The Subcontractor shall place sleeves or block-outs in concrete forms for the passage of all conduit, pipes and ducts installed through underground concrete building foundations and grade beams Sleeves should be set in place a sufficient time ahead of the concrete work so as not to delay that

work Sleeves shall be made of PVC pipe securely fastened in position  
Conduits shall be installed in the center of sleeves and the annular space  
filled with a foam sealant or grout and coated with a tar coating to prevent  
moisture impregnation

- W All conduit installed in outdoor underground duct banks shall be encased by  
others in a red iron oxide pigmented mix concrete envelope having a  
minimum sheath of three (3) inches around the conduits and there shall be a  
minimum of two (2) inches of concrete between conduits Conduits installed  
underground, which are not encased in concrete, shall be installed with a  
yellow, plastic locator ribbon, labeled "ELECTRICAL CIRCUITS," 12  
inches above conduit in ditch
- X Duct runs shall drain toward manholes as indicated on the drawings with a  
minimum slope of 1" 300' A minimum cover of 18" from finished grade to  
top of concrete envelope shall be maintained unless otherwise indicated
- Y Motors shall be connected to the conduit system with flexible conduit (liquid  
tight or explosion proof as applicable) entering side or bottom of the terminal  
box
- Z Manhole entry ducts in the final several feet of duct run approaching each  
manhole may be fanned out to enter the manhole in a manner which will  
permit easy training and protection of the cables
- AA All underground ducts shall be cleared with a mandrel slightly smaller than  
the I D of the duct, followed by a swab before pulling cable into the ducts
- AB It shall be the responsibility of the Subcontractor to protect underground and  
underfloor conduit terminations from all mechanical injury and to prevent the  
entry of moisture and foreign matter into the underfloor or underground  
conduit system by properly capping the terminations
- AC The Subcontractor shall install nylon pull cords in all spare conduits

3-4 Cabinets, Enclosures and Boxes

- A Mounting heights from finished floor to centerline of electrical apparatus  
shall be as follows unless otherwise noted
- |                      |       |
|----------------------|-------|
| Combination starters | 5'-0" |
| Safety switches      | 4'-6" |



|                       |             |
|-----------------------|-------------|
| Manual motor starters | 4'-6"       |
| Control stations      | 4'-0"       |
| Lighting panelboards  | 6'-0" (top) |
| Power panelboards     | 6'-7" (top) |

B Junction and pull boxes shall be supported independently of all associated conduit systems

C Cabinets and enclosures for electrical apparatus shall be set true and plumb and shall be secured rigidly to building, or structural steel, or masonry walls with approved attachment methods

### 3-5 Grounding System

A The Subcontractor shall supply and install ground connection "pigtailes" stubbed-up for connection to the following types of equipment

- 1 transformer neutral grounds,
- 2 motor control center and switchgear ground bus,
- 3 structural columns of buildings,
- 4 process vessels, tanks and skids

B All metal equipment and the metal enclosures of all electrical equipment shall be grounded. An insulated or bare copper ground conductor shall be included with the power or lighting circuits. All metallic conduit that does not terminate in a metallic enclosure shall be bonded to the ground system with a grounding bushing and ground bonding jumper, all grounding bushings at an enclosure shall be jumpered together.

C Not used

D Grid and grounding electrode conductors shall be installed directly in the earth without breaks, at a minimum depth of 18 inches below finished grade when unprotected, and an approximate distance of 30 inches from the outside faces of grade beams, walls or other building's substructures. Minimum burial depth may be reduced to 12 inches when installation is under a protective covering such as a concrete floor slab.

E If any equipment referred to in 3-5-A above is not in contact with grounded structural steel, the Subcontractor shall install a ground conductor from the equipment to the nearest grounded structural steel or underground grid system.

- F Buried grounding conductors shall be laid slack and shall be covered with cinderfree backfill to a minimum depth of six inches (6")
- G All grounding conductors shall be No 4/0 minimum size, unless otherwise specified
- H All ground system connections shall be by exothermic type welding process such as the "Cadweld" process, except at equipment with provisions for a mechanical lug termination (refer to 2-5-C & D) All "Cadweld" type connections shall be hammer tested after installation to ensure mechanical integrity
- I Surfaces where grounding connections are to be made shall be clean and dry Steel surfaces shall be ground or filed to remove all scale, rust, grease, and dirt Copper and galvanized steel shall be cleaned with abrasive cloths to remove oxides before making connections
- J Equipment ground connections to all major power and utilization equipment, such as motor control centers, shall be made with two copper conductors each sized according to the ANSI C1 (NEC) or as specified herein and on the assumed basis that there is no other path to ground
- K Not used

### 3-6 Lighting Fixtures and Lamps

- A The Subcontractor shall install all lighting fixtures at locations shown on the project plan drawings Mounting heights shall be uniform throughout a common area and installation methods shall be as indicated on the applicable details Photoelectric cells on outdoor lighting fixtures shall be mounted facing north
- B Lamps of the type and wattage noted on the project specification lighting drawings shall be installed for the entire lighting system, including replacement of all "burned-out" lamps up to the time that the final acceptance of work occurs

### 3-7 Not used

### 3-8 Painting

- A All switchboards, panel boards, and similar equipment furnished with an

enameled or lacquered finish by the manufacturer, which are scratched or defaced by the Subcontractor during construction, shall be refinished and restored to the original finish by the Subcontractor at his cost

- B The Subcontractor shall apply finish painting to equipment, supports and all other items under his responsibility that had not been previously painted

### 3-9 Electrical Heat Tracing

- A Cables shall be 1 phase, 2 wire, with copper shield Cable lengths shall be checked for actual required length of cable prior to installation
- B Cable shield shall be grounded at the power panels and at the splice boxes Shield shall form a continuous ground path from power panels to end of cable
- C Cables shall be fastened at one foot or less intervals on pipes with a complete wrap of glass cloth pressure-sensitive adhesive tape
- D Loops of cable shall be provided for valves, etc , during installation which shall be folded over to heat the device without requiring cable splices All splices, where necessary, shall be in exposed (above pipe or tank insulation) boxes
- E Thermostats shall be single setting type The 10' capillary and bulb shall be fastened to pipes with glass cloth tape Where practical, thermostats shall be mounted 5' above grade or floor for convenient access All metallic components of the thermostat and bulb shall be coated

### 3-10 Testing

#### A General

- 1 Acceptance of the Subcontractor's work described herein is contingent upon the successful field testing of all electrical apparatus, systems and associated wiring Testing methods shall be in accordance with procedures established by NEMA, ANSI and IEEE, and shall be performed in the presence of a Contractor representative
- 2 All test results and measurement shall be accurately and neatly recorded by the Subcontractor and turned over to Contractor promptly for technical analysis and evaluation when required Contractor reserves the right to

|                                   |                |  |
|-----------------------------------|----------------|--|
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| OU7 Seep Collection and Storage   | Section        | Electrical Materials and Installation, Rev 0 |
| Facility Technical Specifications | Effective Date | January 95                                   |
| Category                          | Organization   | RPD  |

witness all tests and commissioning functions, and to interpret and approve all test results Prior to initial energization of circuits or apparatus, Contractor shall be notified in advance

- 3 Wire and cable, 600 volts and below, shall be tested as follows All cables and leads shall be tested for continuity and power leads shall be given a megger test Each phase shall be tested between conductor and ground and between phases Minimum megger readings at ambient temperatures shall be

30 megohms - 480 volt conductors,  
20 megohms - for lower voltage services

Tests shall be made with cable installed in conduit or tray, but prior to being connected to equipment In addition, motors shall be meggered before connection to cable and the entire circuit meggered after connection Motor circuits should not be energized if the entire circuit measures less than 1 megohm per kilovolt, plus 1/2 megohm (extreme minimum)

#### B Ground System Testing

- 1 Not used
- 2 After interconnection of the complete ground grid as outlined in paragraph 3-5, the Subcontractor shall supply and install sufficient additional ground rods so that the measured value of ground resistance at each test point does not exceed 5 0 OHMS when measured by the "Fall of Potential" method There shall be one test point installed at each end of the facility
- 3 The measured resistance at each grounding electrode and the resistance of the completed ground grid system shall be accurately and neatly recorded This log shall be presented to Contractor at the completion of each installation

#### C Insulation Resistance Testing

- 1 Prior to energization, Subcontractor shall use a "Megger" instrument to measure insulation resistance between individual conductors and from conductors and apparatus windings such as motors, transformers, etc to ground Wiring or apparatus not measuring up to the minimum values required by the testing authority or code regulation shall be put into acceptable condition A certified log shall be kept of such tests, which shall

92

include both test values and dates This log shall be presented to Contractor before the completion of the job Control and instrumentation wiring shall not be "Meggered "

D Apparatus Inspection

- 1 Prior to energization, major electrical apparatus shall be afforded, but not necessarily limited to the following inspections, tests, and measurements

- a Distribution and lighting transformers

Winding insulation resistance tests and measurements between primary and secondary and ground, and between primary and secondary

Voltage level measurements

- b Not used

- c Motor Control Apparatus

Bus and branch circuit wiring insulation resistance tests,

Contactor, switch and control relay mechanical operational check,

Check stab-on contacts, fuse clips, etc , for proper spring tension and clean contact surface,

Installation check for all fuses and overload heater elements for proper size and rating The subSubcontractor shall be responsible for replacements as necessary

Wiring connection check for accuracy and integrity,

Mechanical operation check of each cell unit, including plug-in and door interlock hardware

- d Rotating Apparatus

Winding insulation resistance tests and measurements, line to

ground, and line to line,

Mechanical rotation freedom check,

Wiring connection check for accuracy and integrity,

Installation check of all cover plates and mechanical guards

E Operation Testing

- 1 Upon completion of the electrical installation, and at such time as Contractor may direct, the Subcontractor shall conduct apparatus and system operating tests for approval and acceptance purposes. All apparatus, control schemes, interlocking, safety and protective devices, etc., shall be demonstrated to operate and function in accordance with the requirements of this specification and as shown on the applicable drawings. These tests shall be performed in the presence of Contractor or apparatus suppliers, as required. All system malfunctions and improper operation disclosed through these tests shall be corrected and placed into acceptable condition.
- 2 All control and instrumentation circuits shall be checked for continuity, grounds, polarity, shorts, and correctness of operation with a volt-ohm meter.
- 3 All instrumentation shall be calibrated, functionally tested, and valves stroked prior to start-up, with a Subcontractor/Contractor inspector in attendance.
- 4 The Subcontractor shall record for each motor the nameplate full load amps, actual running amps, and overload heater size installed. This log shall be presented to Contractor before completion of the job.

3-11 Temporary Power And Light

- A The Subcontractor shall provide, install and maintain a temporary lighting and power system as required during the course of construction. Power for the temporary systems shall be obtained from portable generators or from new service drops from Contractor's existing system installed by the Subcontractor.
- B The temporary power and lighting systems may have the following characteristics:  
  
Power 480 volts, three phase, three wire, 60 Hertz, grounded or 125 V single phase,

|                                   |                |  |
|-----------------------------------|----------------|--|
| EG&G Rocky Flats Plant            | Manual         | RF/ER-94-00044                               |
| OU7 Seep Collection and Storage   | Section        | Electrical Materials and Installation, Rev 0 |
| Facility Technical Specifications | Effective Date | January 95                                   |
| Category                          | Organization   | RPD  |

15A or 20A receptacles, with GFCI protection

Lighting 208Y/120 volts, three phase, four wire, 60 Hertz, grounded

### 3-12 Clean-Up

- A The Subcontractor shall maintain the area in which he is working reasonably clean of debris, working materials, and tools. Upon leaving any area of work, after the completion of work in that section, he shall remove all debris, rubbish, and unused materials, except those belonging to the client or other Subcontractors.

### 3-13 Safety Procedures

- A Special precautions must be taken on machines or processes which can cause injuries or fatalities during installation and energization of equipment
  - 1 Not used
  - 2 These precautions shall be taken prior to making any adjustments on a machine or process to prevent accidental starting
    - a Determine which switch will de-energize the equipment
    - b Open the switch
    - c Attempt to operate equipment
    - d When equipment does not operate, place a padlock on the open switch. All others working on this equipment must also place their padlocks on the switch, including supervisory personnel
    - e A voltage check is required on equipment
    - f Each man's lock remains on the switch until he has completed his work, then it is removed
- B During installation, portable tools and cords must be checked to make sure there is a third wire grounding the equipment being used. Portable tools shall be protected with ground fault circuit interrupters which automatically trip whenever a ground current is sensed.

- C Malfunctions of main circuit breakers and switches handling large amounts of power could result in explosion of the equipment This is particularly true when new equipment is being tried for the first time Recommended procedures are
- 1 Wear gauntlet type gloves
  - 2 Wear safety glasses
  - 3 Stand to one side of the switch, not directly in front of it
  - 4 Turn face opposite way from switch
  - 5 Keep all other personnel away from the front of the switch and at least 6' to either side
  - 6 Close (or open) the switch quickly, never slowly
- D During start-up it is desirable to develop in advance the detailed procedure or plan to perform each step of work safely Special precautions should be taken during start-up to insure that the equipment will be started in an orderly, controlled manner During the start-up period, it is recommended that two (2) men work on testing or repair of equipment where hazards are involved The function of the second man is to stand by and make sure that the safety procedures are being followed and that the main power or control switch will be thrown off quickly in event of an accident
- E If defective parts are found during testing, the equipment should be de-energized and voltage checks made before attempting to repair Bare hands should not be used to replace parts such as fuses Once an object is firmly grasped and accidental shock occurs, it may not be possible to release the grip Insulated tools, such as insulated screw drivers, fuse pullers and similar tools, should be used to repair equipment instead of using bare hands
- F The Subcontractor shall be responsible for carrying out the above recommended safety procedures and shall coordinate all activities